FCC PART 15.247
TEST REPORT

For

PERI, Inc.

19782 MacArthur Blvd, Suite 230, Irvine, CA 92612

FCC ID: 2AGAB-DUO

Report Type:	**Product Type:**
Original Report	iPhone speaker and charging case

Test Engineer:	Matt Yao
Report Number:	RKS151103001-00A
Report Date:	2015-12-03
Reviewed By:	Jesse Huang EMC Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) Chenghu Road,Kunshan Development Zone No.248,Kunshan, Jiangsu, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The PERI, Inc.'s product, model number: PERIDUO6 (FCC ID: 2AGAB-DUO) or the "EUT" in this report was a iPhone speaker and charging case, which was measured approximately: 150 mm (L)x68 mm (W) x 23 mm (H), rated input voltage: DC 5.0 V.

**All measurement and test data in this report was gathered from production sample serial number: 20151102001 (Assigned by the BACL.The EUT supplied by the applicant was received on 2015-10-21)*

Objective

This test report is prepared on behalf of PERI, Inc. in accordance with Part 2-Subpart J, Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS and FCC Part 15B JBP submission with FCC ID: 2AGAB-DUO.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB558074 D01 DTS Meas Guidance v03r04.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with RF radiated emission is 5.91 dB for 30MHz-1GHz.and 4.92 dB for above 1GHz, 1.95dB for conducted measurement.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the Chenghu Road, Kunshan Development Zone No.248, Kunshan, Jiangsu, China.

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode which was controlled by Software.

EUT Exercise Software

Bluetool

GFSK :Power level 7
π/4-DQPSK :Power level 7
8DPSK :Power level 7

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

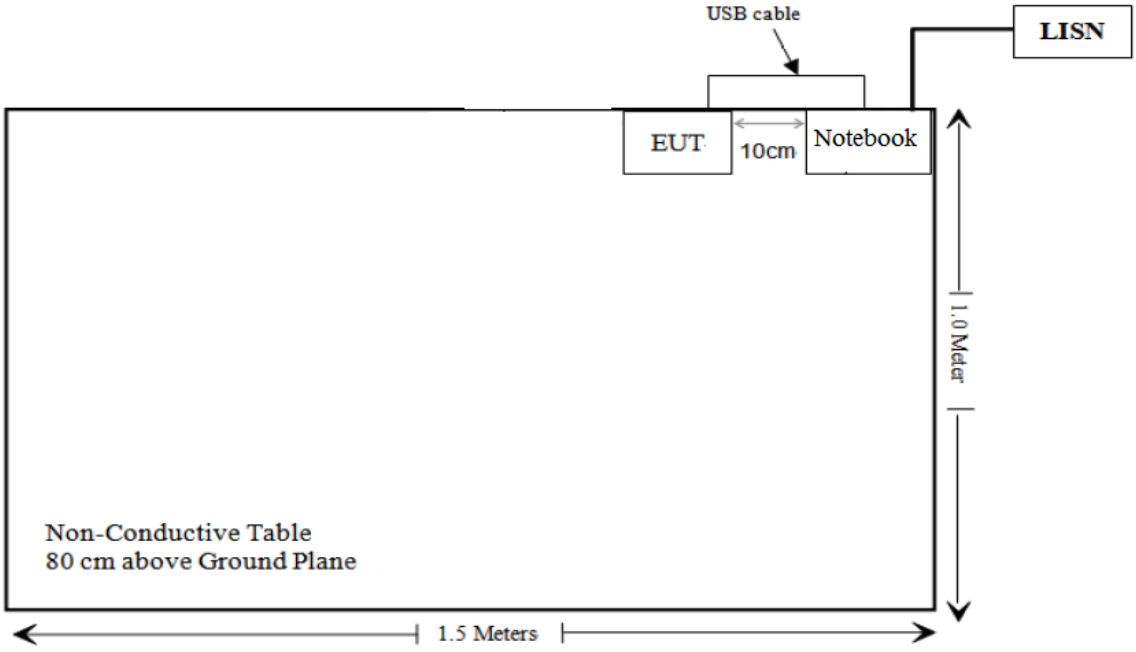
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Lenovo	Notebook	T400	N/A

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Detachable USB Cable	0.9	EUT	PC

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1310 & §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliance
§15.247(a)(1)	20 dB Emission Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band edges	Compliance

FCC§15.247 (i), §1.1310& §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC § 1.1310& §2.1093， systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency level in excess of the Commission's guideline.

The SAR data please refer to the SAR report, report No.: RSH151112050-20A.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has a PCB antenna arrangement for bluetooth, which was permanently attached and the antenna gain is 2 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

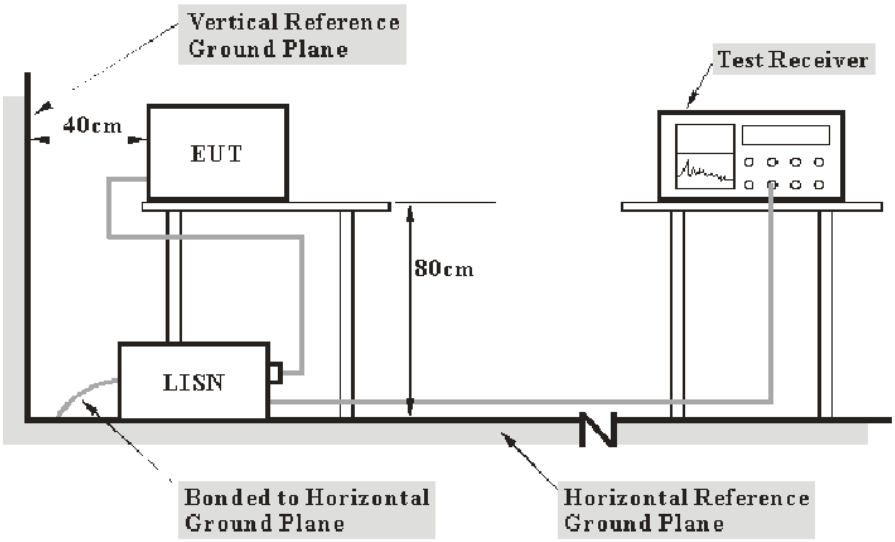
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN and receiver, LISN voltage division factor, LISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Kunshan) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report.

Port	Expanded Measurement uncertainty
AC Mains	3.26 dB (k=2, 95% level of confidence)
CAT 3	3.70 dB (k=2, 95% level of confidence)
CAT 5	3.86 dB (k=2, 95% level of confidence)
CAT 6	4.64 dB (k=2, 95% level of confidence)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The adapter was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	934115/007	2015-11-12	2016-11-11
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2015-11-12	2016-11-11
Rohde & Schwarz	LISN	ESH3-Z5	892239/018	2015-06-23	2016-06-22
Rohde & Schwarz	Pulse limiter	ESH3-Z2	879940/0058	2015-06-19	2016-06-18
HP	Current probe	8710-1744	636	2015-06-19	2016-06-18
FCC	ISN	FCC-TLISN-T8-02	20376	2015-06-23	2016-06-22
MICRO-COAX	Coaxial line	UFB-293B-1-0480-50X50	97F0173	2015-10-01	2016-10-01
Rohde & Schwarz	CE Test software	EMC 32	V 09.10.0	--	--

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, the worst margin reading as below:

11.09 dB at **0.155000 MHz** in the **Neutral** conducted mode

Refer to CISPR16-4-2and CISPR 16-4-1, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

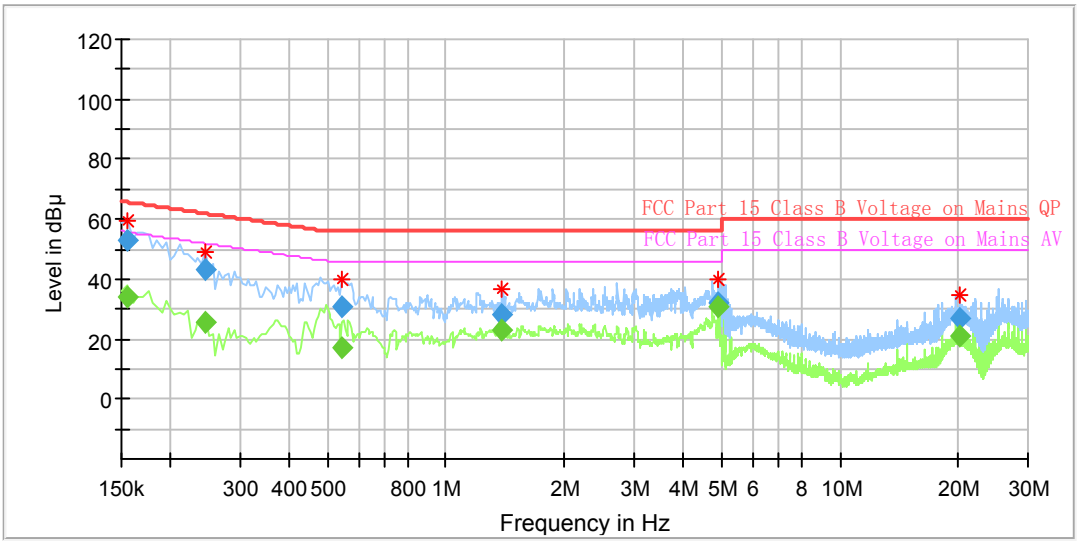
Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Matt Yao on 2015-11-05.

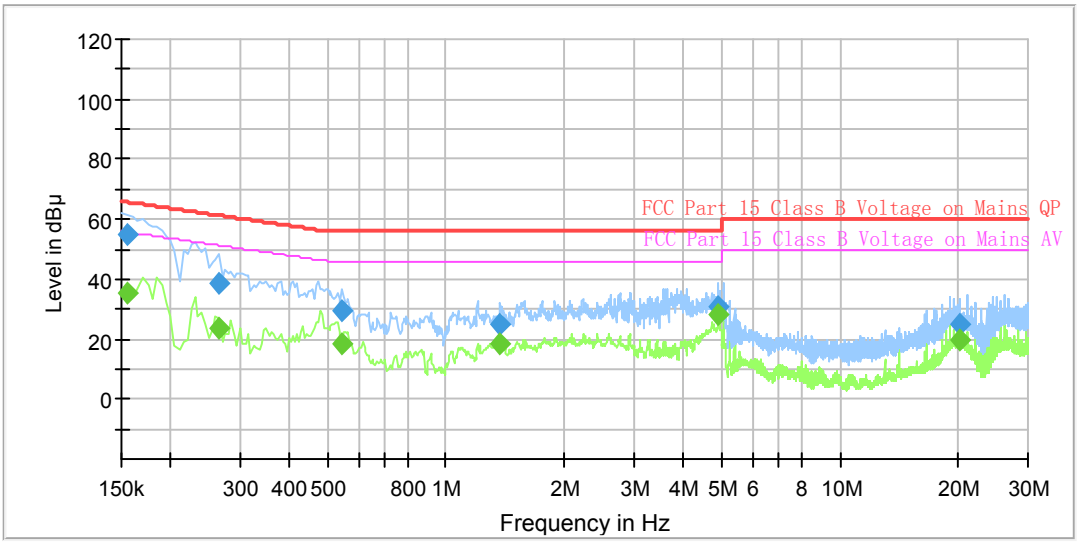
EUT operation mode: Charging & Transmitting

AC 120V/60 Hz, Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.155000	---	33.86	9.000	L1	11.0	21.87	55.73	Compliance
0.155000	52.63	---	9.000	L1	11.0	13.10	65.73	Compliance
0.245000	---	25.36	9.000	L1	11.0	26.56	51.92	Compliance
0.245000	43.48	---	9.000	L1	11.0	18.44	61.92	Compliance
0.545000	---	17.27	9.000	L1	11.0	28.73	46.00	Compliance
0.545000	30.85	---	9.000	L1	11.0	25.15	56.00	Compliance
1.390000	---	22.72	9.000	L1	11.1	23.28	46.00	Compliance
1.390000	28.04	---	9.000	L1	11.1	27.96	56.00	Compliance
4.925000	---	30.65	9.000	L1	11.3	15.35	46.00	Compliance
4.925000	31.84	---	9.000	L1	11.3	24.16	56.00	Compliance
20.215000	---	20.99	9.000	L1	11.4	29.01	50.00	Compliance
20.215000	26.92	---	9.000	L1	11.4	33.08	60.00	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.155000	---	35.32	9.000	N	11.0	20.41	55.73	Compliance
0.155000	54.64	---	9.000	N	11.0	11.09	65.73	Compliance
0.265000	---	23.80	9.000	N	11.0	27.47	51.27	Compliance
0.265000	38.53	---	9.000	N	11.0	22.74	61.27	Compliance
0.545000	---	18.50	9.000	N	11.0	27.50	46.00	Compliance
0.545000	29.38	---	9.000	N	11.0	26.62	56.00	Compliance
1.375000	---	18.35	9.000	N	11.1	27.65	46.00	Compliance
1.375000	25.12	---	9.000	N	11.1	30.88	56.00	Compliance
4.900000	---	28.50	9.000	N	11.4	17.50	46.00	Compliance
4.900000	30.70	---	9.000	N	11.4	25.30	56.00	Compliance
20.215000	---	19.61	9.000	N	11.4	30.39	50.00	Compliance
20.215000	24.62	---	9.000	N	11.4	35.38	60.00	Compliance

Note:
1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss
2) Corrected Amplitude = Reading + Corr.
3) Margin = Limit –Corrected Amplitude

FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

FCC §15.205; §15.209; §15.247(d)

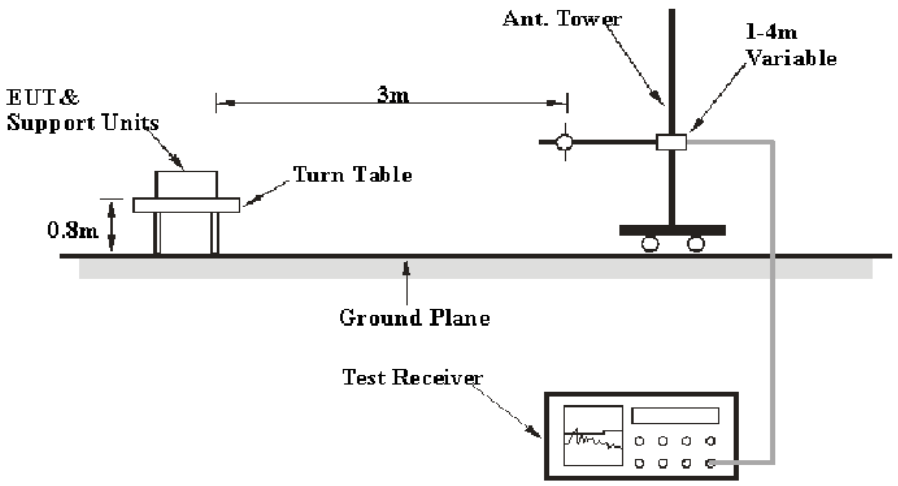
Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

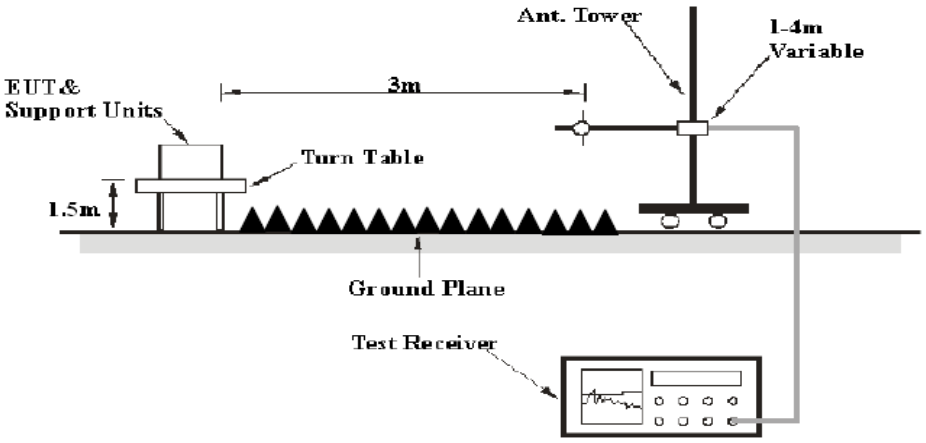
Based on CISPR 16-4-2, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) is 5.91 dB for 30MHz-1GHz, and 4.92 dB for above 1GHz. And this uncertainty will not be taken into consideration for the test data recorded in the report.

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 limits.

The adapter was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrunent	Amplifier	330	171377	2015-09-16	2016-09-16
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2014-11-12	2015-11-11
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2014-11-07	2015-11-06
ETS	Horn Antenna	3115	6229	2014-11-07	2015-11-06
EMCO	Horn Antenna	3116	9510-2384	2014-11-07	2015-11-06
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2014-11-12	2015-11-11
Mini	Pre-amplifier	ZVA-183-S+	857001418	2015-09-16	2016-09-16
DUCOMMUN	Pre-amplifier	ALN-22093530-01	990147	2015-09-16	2016-09-16
champrotek	Chamber	Chamber A	1#	2015-09-17	2016-09-17
R&S	Auto test Software	EMC32	V 09.10.0	-	-
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-06-16	2016-12-15
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-06-16	2016-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

1.75 dB at 4882 **MHz** in the **Horizontal** polarization for middle channel

Refer to CISPR16-4-2 and CISPR 16-4-1, the measured level complies with the limit if

$$L_m ++ U_{(Lm)} \leq L_{lim} ++ U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than + U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

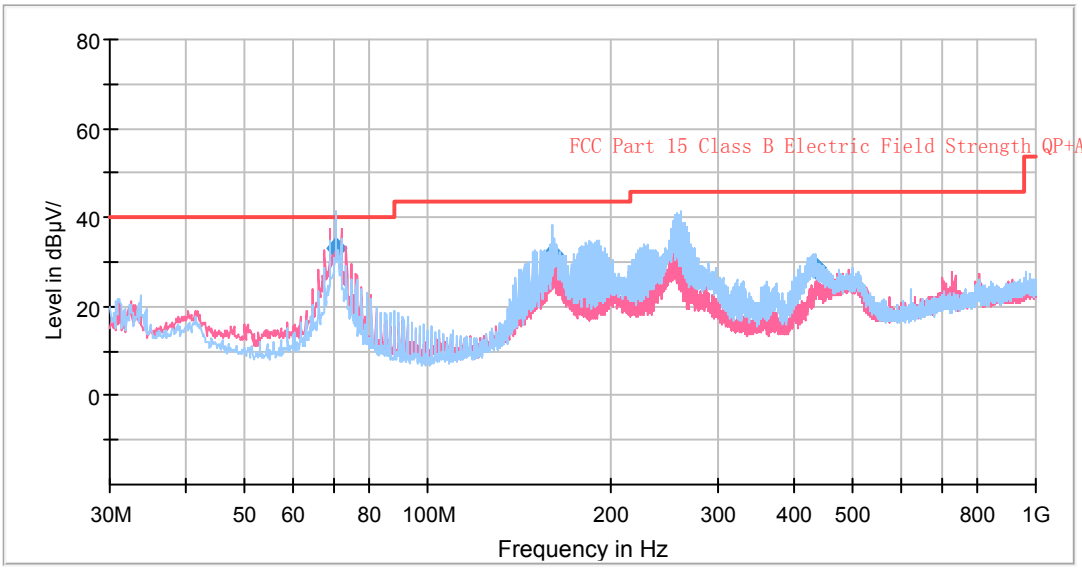
Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Matt Yao on 2015-11-05.

EUT operation mode: Normal operation

30MHz-1GHz:



Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBµV/m)	FCC Part 15.247/205/209	
	Reading (dBµV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
70.6001000	50.07	QP	185.0	200.0	H	-17.0	33.07	40.00	6.93
160.231500	43.93	QP	180.0	200.0	H	-12.3	31.63	43.50	11.87
184.298900	35.51	QP	161.0	100.0	H	-11.8	23.71	43.50	19.79
229.462200	34.82	QP	237.0	100.0	H	-12.1	22.72	46.00	23.28
258.893800	42.79	QP	237.0	100.0	H	-11.4	31.39	46.00	14.61
433.895050	35.86	QP	161.0	100.0	H	-7.3	28.56	46.00	17.44

1G -25 GHz: (*Scan with GFSK, π/4-DQPSK, 8-DPSK mode, the worst case is BDR Mode (GFSK)*)

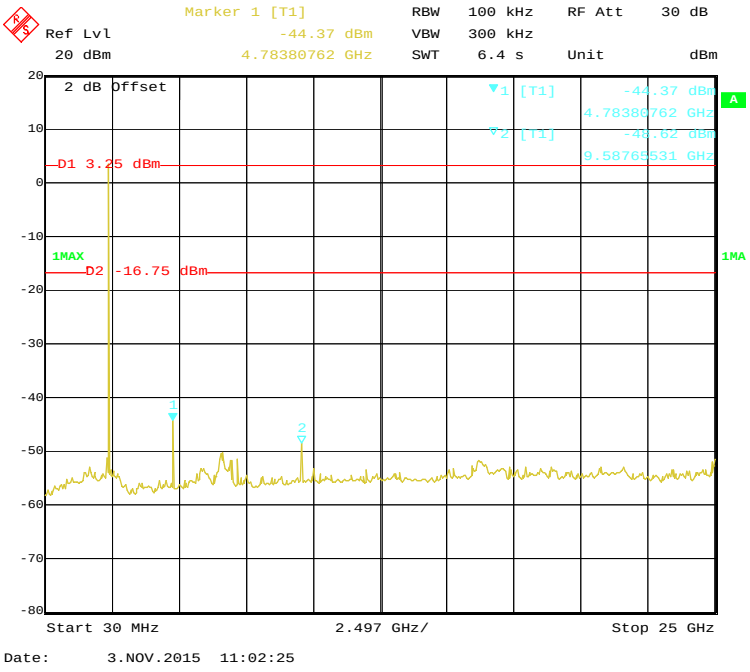
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2402 MHz)									
2402	97.01	PK	54	2.0	H	3.0	100.01	/	/
2402	89.05	Ave.	54	2.0	H	3.0	92.05	/	/
2402	96.55	PK	43	2.0	V	3.0	99.55	/	/
2402	89.13	Ave.	43	2.0	V	3.0	92.13	/	/
2354	41.08	PK	299	2.0	V	4.1	45.18	74	28.82
2354	35.89	Ave.	299	2.0	V	4.1	39.99	54	14.01
2390	40.66	PK	282	2.0	V	4.1	44.76	74	29.24
2390	35.29	Ave.	282	2.0	V	4.1	39.39	54	14.61
4804	40.57	PK	324	2.0	H	13.7	54.27	74	19.73
4804	37.01	Ave.	324	2.0	H	13.7	50.71	54	3.29
6654	37.39	PK	143	1.5	H	17.4	54.79	74	19.21
6654	24.48	Ave	143	1.5	H	17.4	41.88	54	12.12
7206	41.23	PK	12	2.0	V	20.5	61.73	74	12.27
7206	30.08	Ave.	12	2.0	V	20.5	50.58	54	3.42

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Middle Channel (2441 MHz)									
2441	87.96	PK	38	2.0	H	2.6	90.56	/	/
2441	78.63	Ave.	38	2.0	H	2.6	81.23	/	/
2441	86.92	PK	54	2.0	V	2.6	89.52	/	/
2441	78.35	Ave.	54	2.0	V	2.6	80.95	/	/
1597	32.06	Ave.	186	2.0	H	0.7	32.76	54	21.24
1597	47.54	PK	186	2.0	H	0.7	48.24	74	25.76
2132	41.89	PK	219	2.0	V	4.0	45.89	74	28.11
2132	27.54	Ave.	219	2.0	V	4.0	31.54	54	22.46
4882	38.35	Ave.	310	2.0	H	13.9	52.25	54	1.75
4882	40.93	PK	310	2.0	H	13.9	54.83	74	19.17
6561	37.34	PK	159	1.5	H	17.4	54.74	74	19.26
6561	24.75	Ave	159	1.5	H	17.4	42.15	54	11.85
7323	36.09	PK	348	2.0	H	20.8	56.89	74	17.11
7323	30.74	Ave.	348	2.0	H	20.8	51.54	54	2.46
High Channel (2480 MHz)									
2480	87.46	PK	191	1.5	H	3.2	90.66	/	/
2480	79.03	Ave.	191	1.5	H	3.2	82.23	/	/
2480	86.92	PK	306	2.5	V	3.2	90.12	/	/
2480	78.37	Ave.	306	2.5	V	3.2	81.57	/	/
2136	21.71	Ave.	251	2.0	V	4.0	25.71	54	28.29
2136	34.87	PK	251	2.0	V	4.0	38.87	74	35.13
2483.5	21.69	Ave.	143	2.0	V	4.7	26.39	54	27.61
2483.5	37.17	PK	143	2.0	V	4.7	41.87	74	32.13
2589	21.66	Ave.	221	2.0	V	5.0	26.66	54	27.34
2589	35.05	PK	221	2.0	V	5.0	40.05	74	33.95
4960	39.09	PK	10	2.0	V	14.1	53.19	74	20.81
4960	35.3	Ave.	10	2.0	V	14.1	49.4	54	4.60
7440	35.01	PK	20	2.0	H	21.2	56.21	74	17.79
7440	29.09	Ave.	20	2.0	H	21.2	50.29	54	3.71

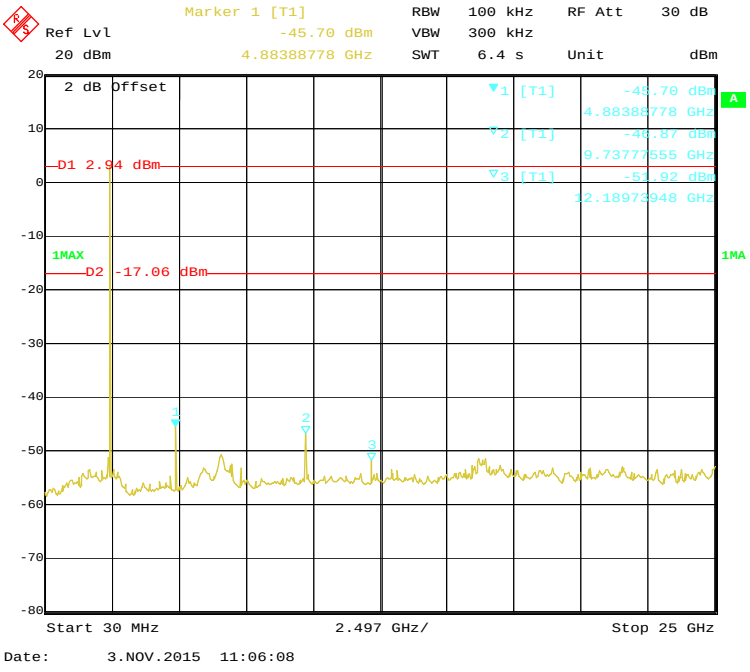
Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude

Conducted Spurious Emissions at Antenna Port

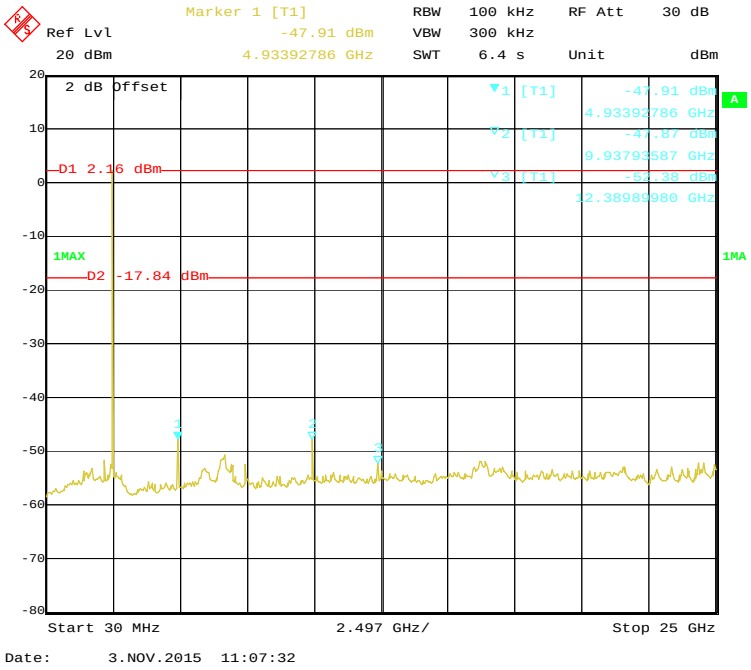
Low Channel



Middle Channel



High Channel



FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

Test Procedure

1. Set the EUT in transmitting mode, maxhold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace.
3. Measure the channel separation.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2014-11-12	2015-11-11
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-06-16	2015-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Matt Yao on 2015-11-03.

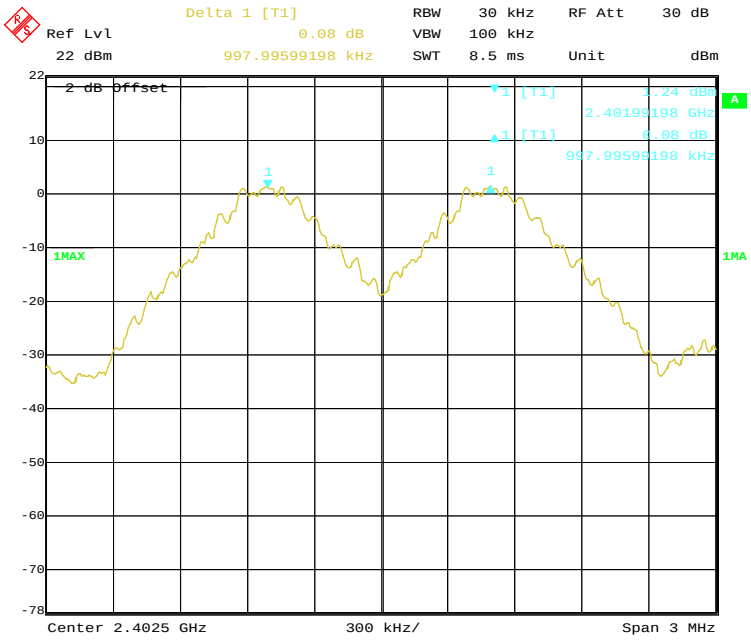
EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots

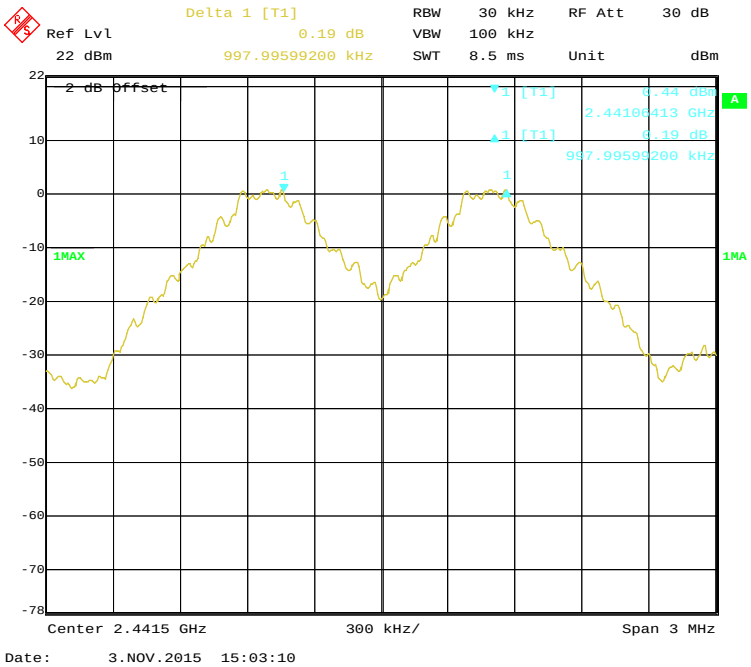
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	≥Limit (MHz)	Result
BDR (GFSK)	Low	2402	0.998	0.660	Pass
	Adjacent	2403			
	Middle	2441	0.998	0.663	Pass
	Adjacent	2442			
	High	2480	1.010	0.657	Pass
	Adjacent	2479			
EDR (π/4-DQPSK)	Low	2402	1.004	0.895	Pass
	Adjacent	2403			
	Middle	2441	0.998	0.893	Pass
	Adjacent	2442			
	High	2480	1.004	0.893	Pass
	Adjacent	2479			
EDR (8DPSK)	Low	2402	0.998	0.871	Pass
	Adjacent	2403			
	Middle	2441	0.998	0.874	Pass
	Adjacent	2442			
	High	2480	1.004	0.869	Pass
	Adjacent	2479			

Note: Limit = 20 dB bandwidth *2/3

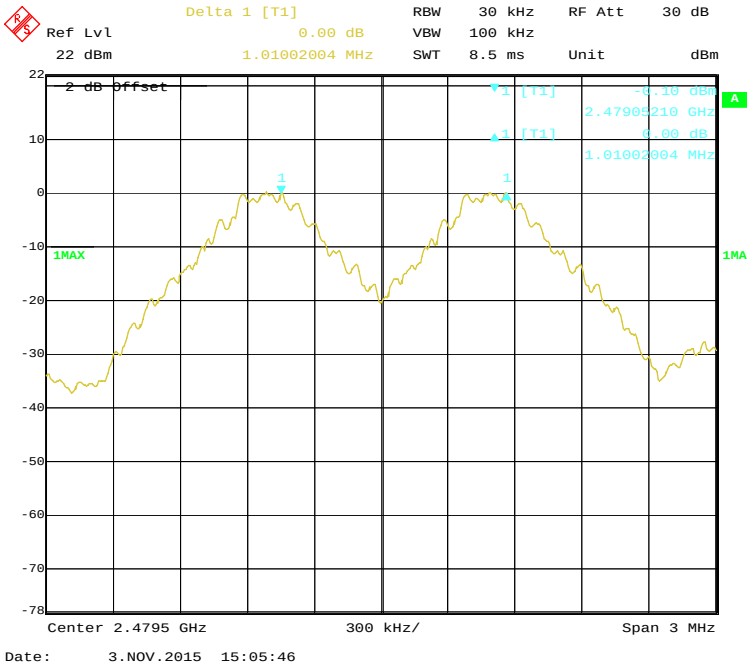
BDR (GFSK): Low Channel



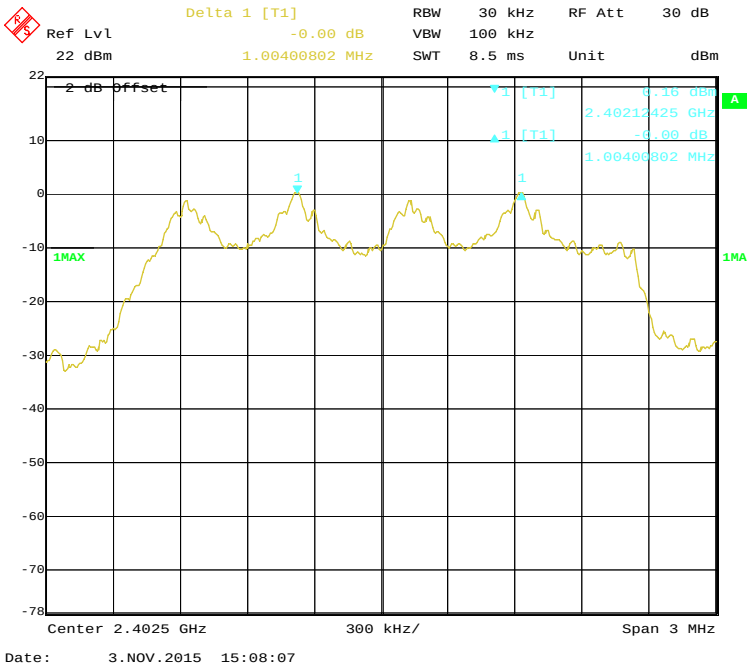
BDR (GFSK): Middle Channel



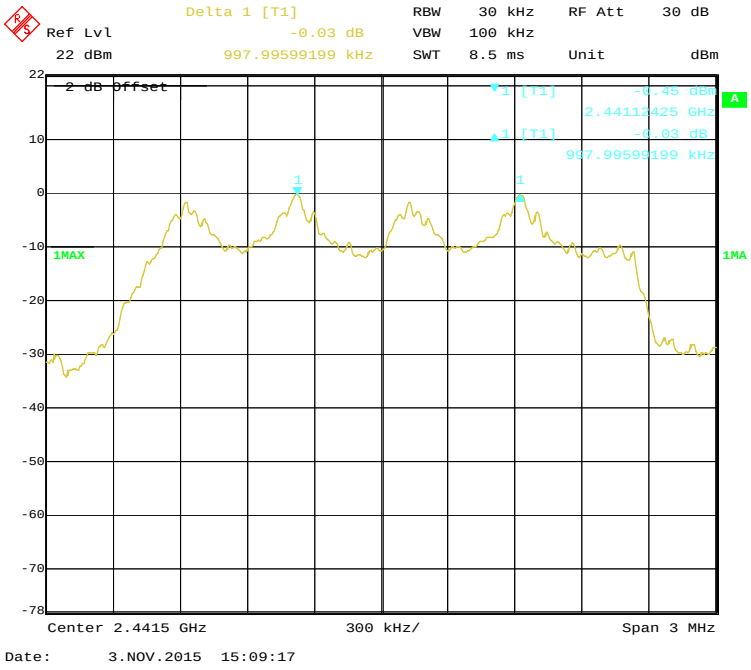
BDR (GFSK): High Channel



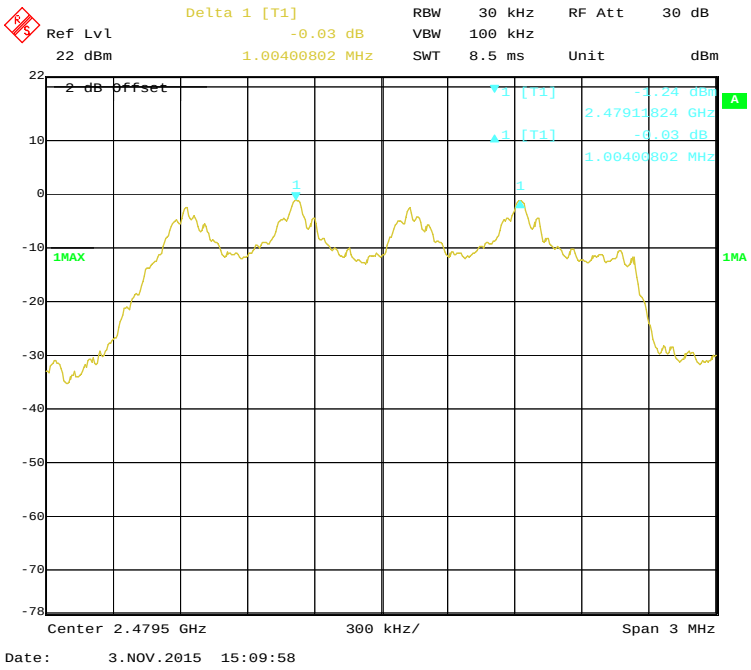
EDR (π/4-DQPSK): Low Channel



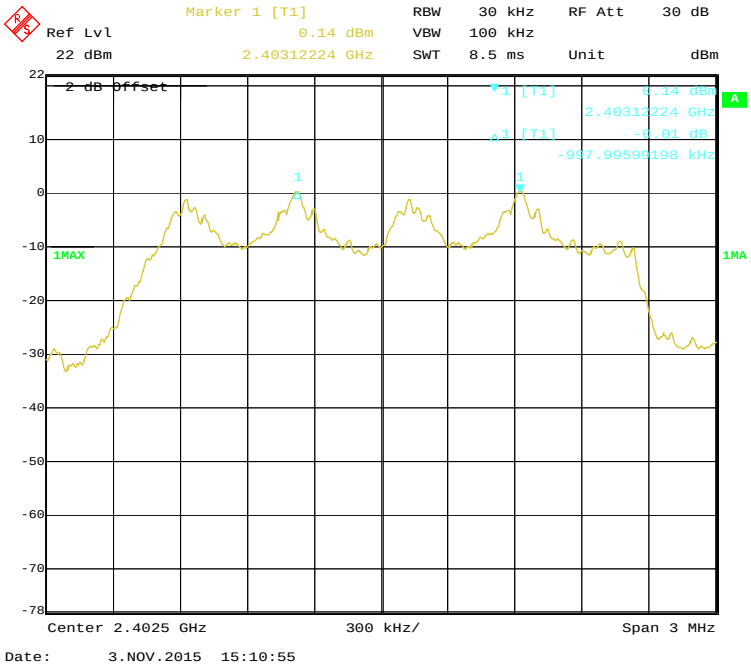
EDR (π/4-DQPSK): Middle Channel



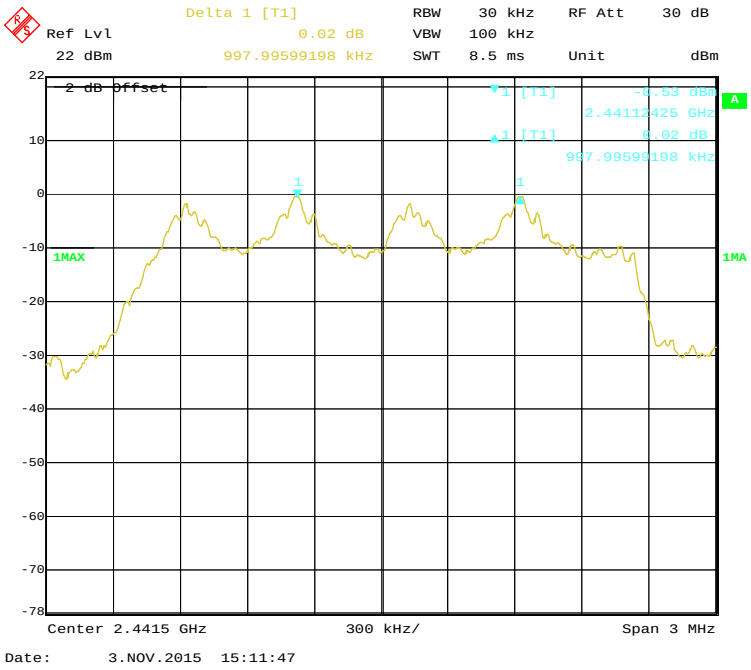
EDR (π/4-DQPSK): High Channel



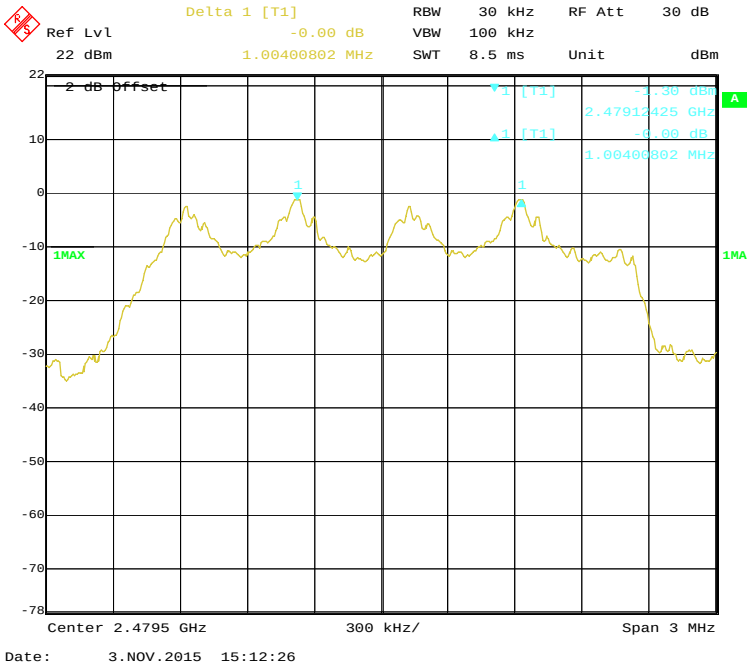
EDR (8DPSK): Low Channel



EDR (8DPSK): Middle Channel



EDR (8DPSK): High Channel



FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH

Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2014-11-12	2015-11-11
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-06-16	2015-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

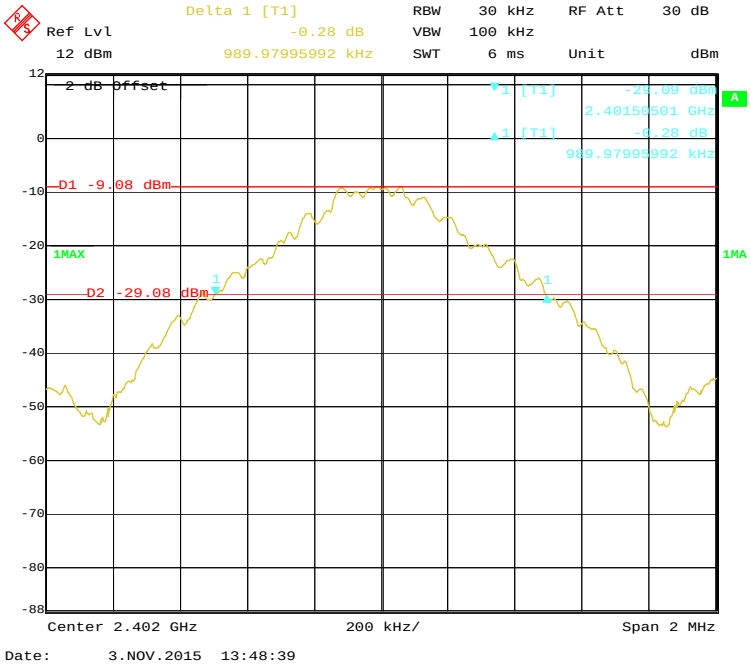
The testing was performed by Matt Yao on 2015-11-03.

EUT operation mode: Transmitting

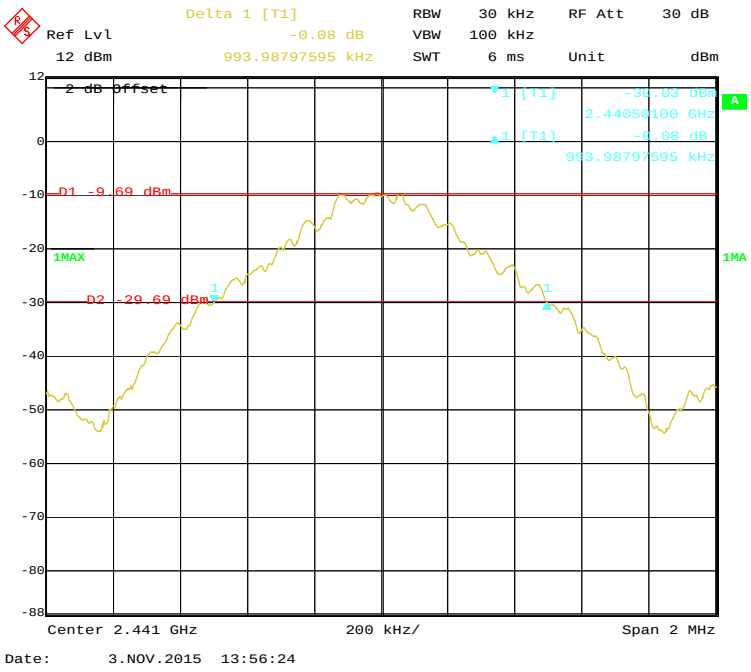
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.990
	Middle	2441	0.994
	High	2480	0.986
EDR (π/4-DQPSK)	Low	2402	1.343
	Middle	2441	1.339
	High	2480	1.339
EDR (8DPSK)	Low	2402	1.307
	Middle	2441	1.311
	High	2480	1.303

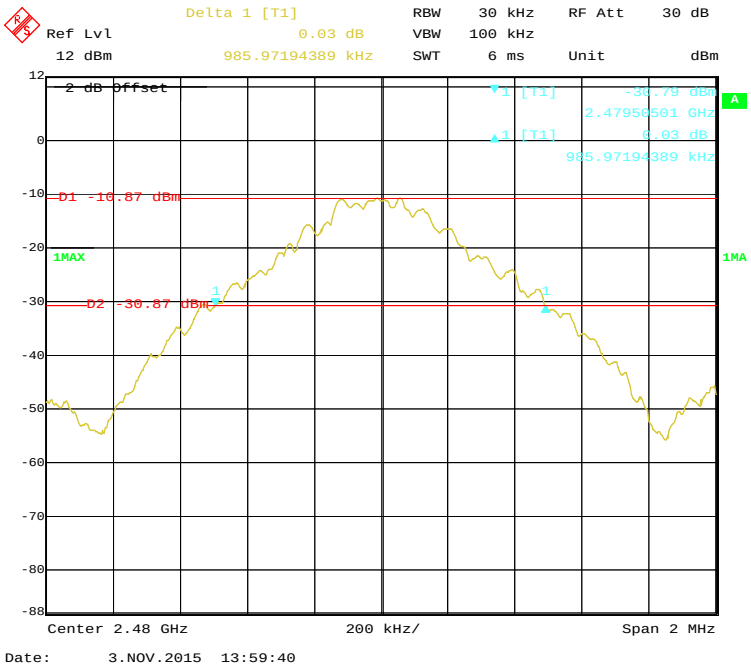
BDR (GFSK): Low Channel



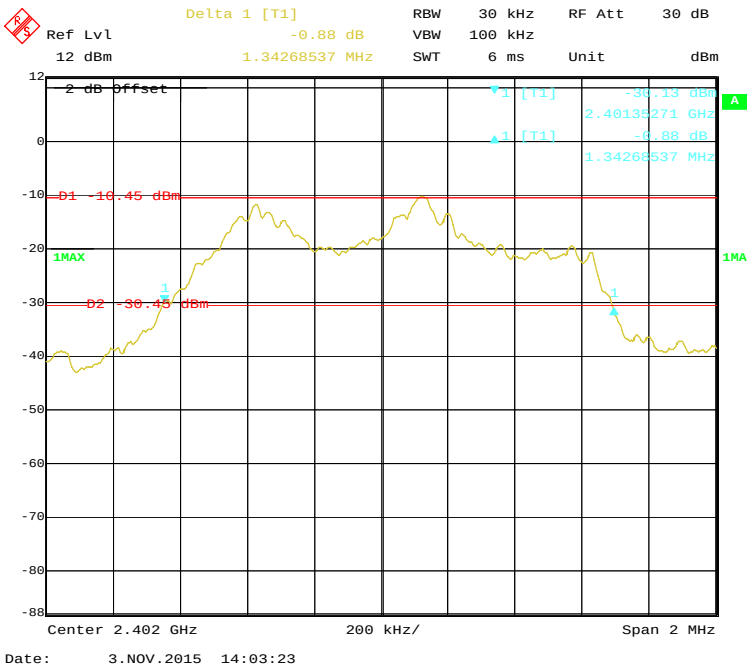
BDR (GFSK): Middle Channel



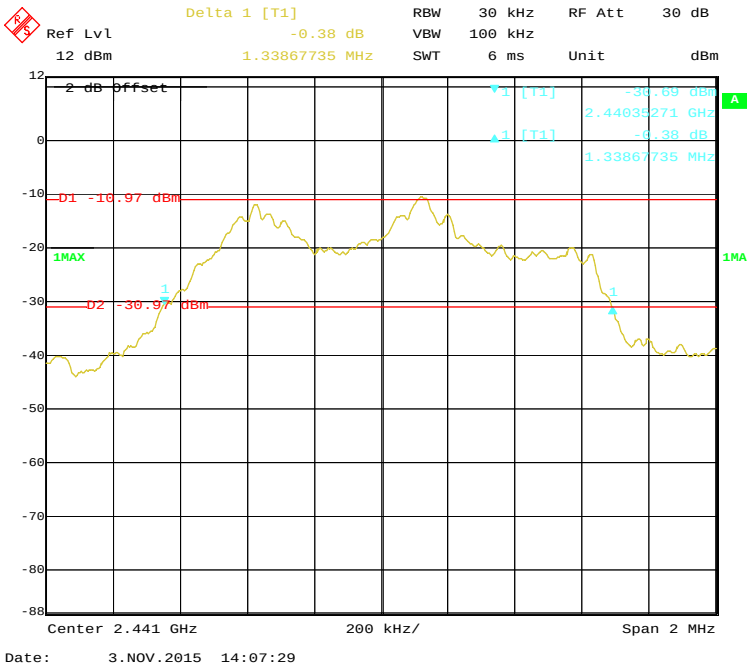
BDR (GFSK): High Channel



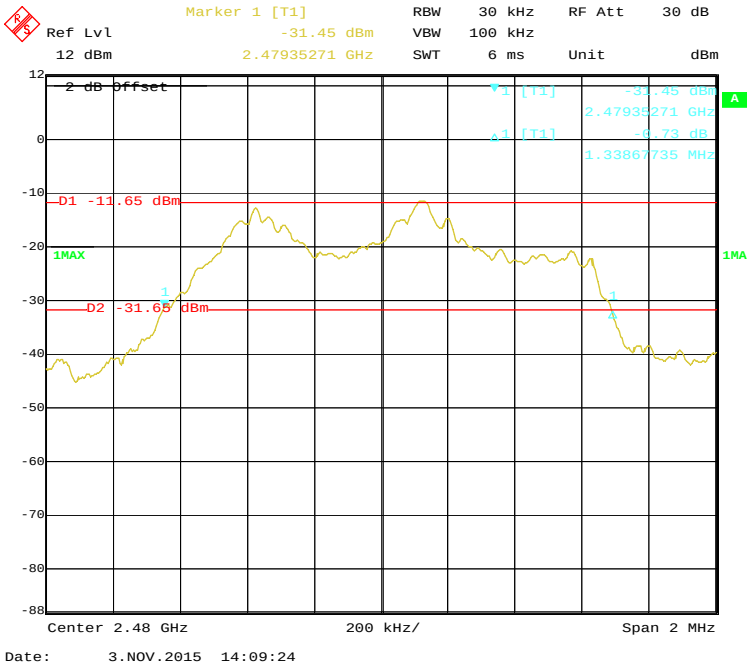
EDR (π/4-DQPSK): Low Channel



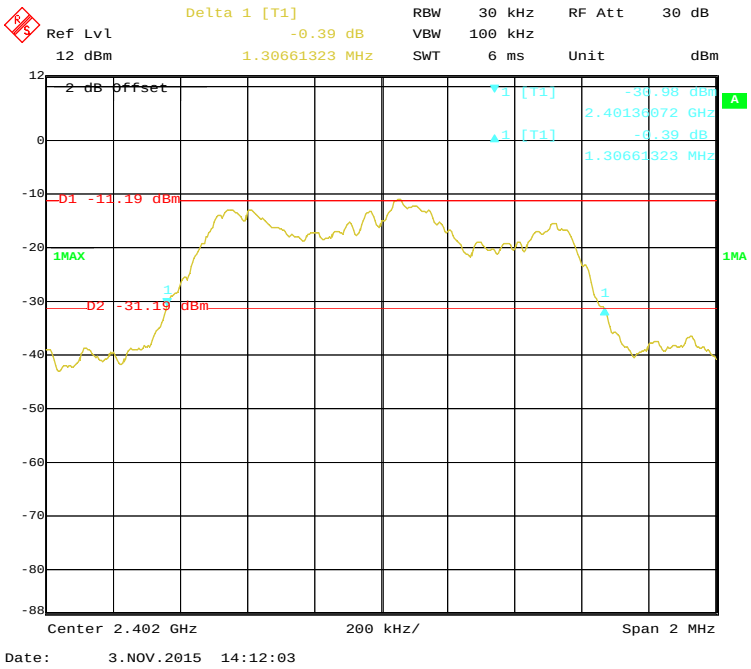
EDR (π/4-DQPSK): Middle Channel



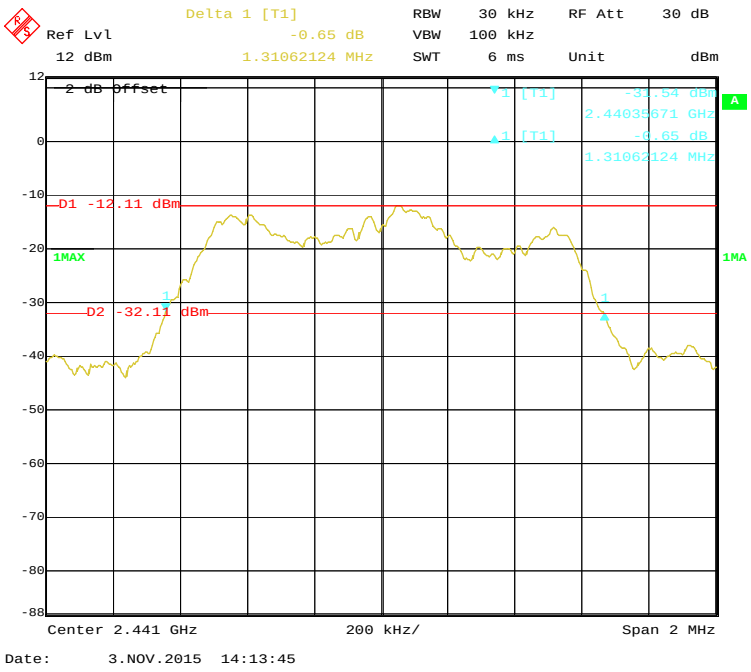
EDR (π/4-DQPSK): High Channel



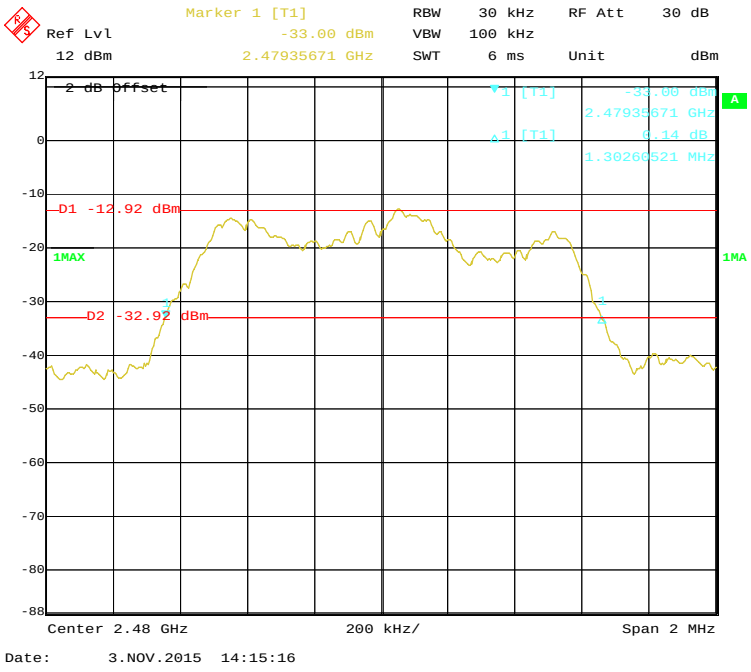
EDR (8DPSK): Low Channel



EDR (8DPSK): Middle Channel



EDR (8DPSK): High Channel



FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the max-hold function record the quantity of the channel.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2014-11-12	2015-11-11
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-06-16	2015-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

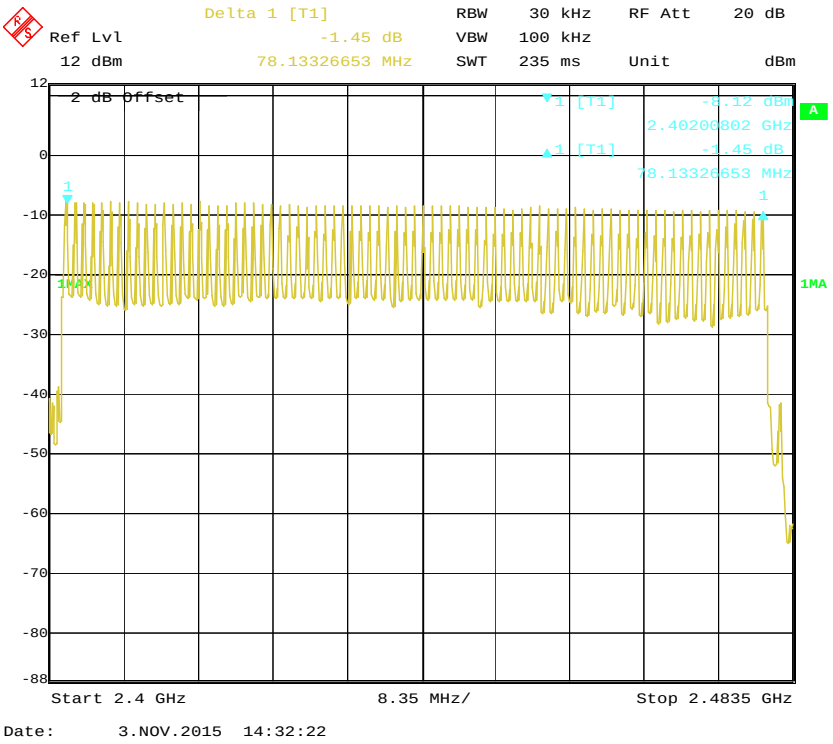
The testing was performed by Matt Yao on 2015-11-03.

EUT operation mode: Transmitting

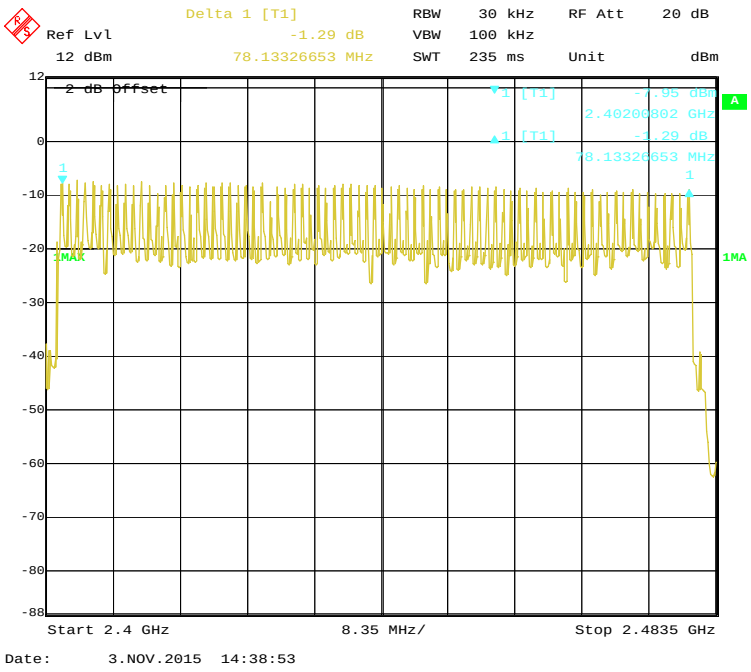
Test Result: Compliance. Please refer to following tables and plots

Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2400-2483.5	79	≥15
EDR (π/4-DQPSK)	2400-2483.5	79	≥15
EDR (8DPSK)	2400-2483.5	79	≥15

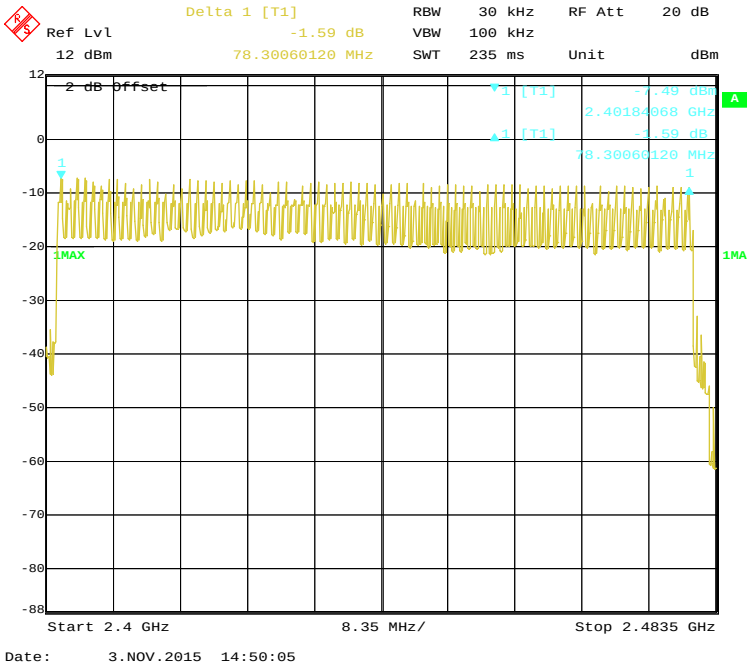
BDR (GFSK): Number of Hopping Channels



EDR (π/4-DQPSK): Number of Hopping Channels



EDR (8DPSK): Number of Hopping Channels



FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 X channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2014-11-12	2015-11-11
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-06-16	2015-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

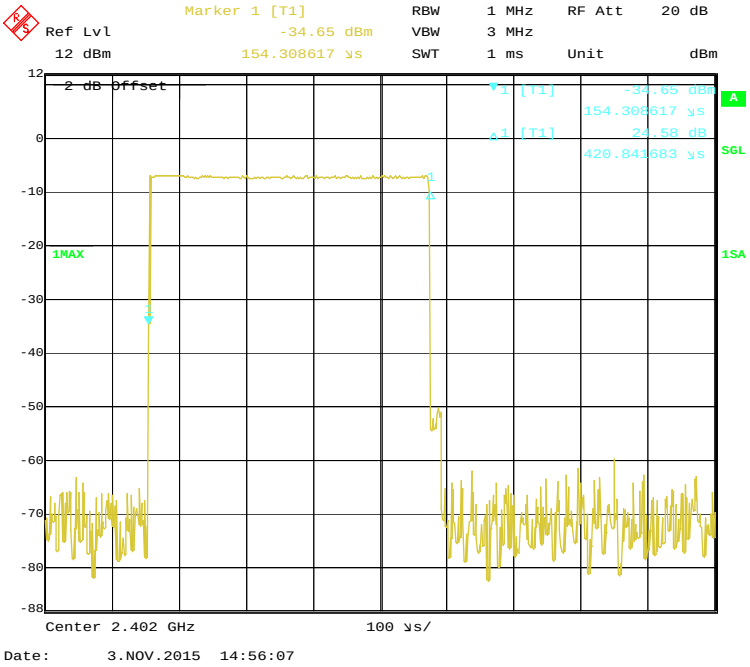
The testing was performed by Matt Yao on 2015-11-03.

EUT operation mode: Transmitting

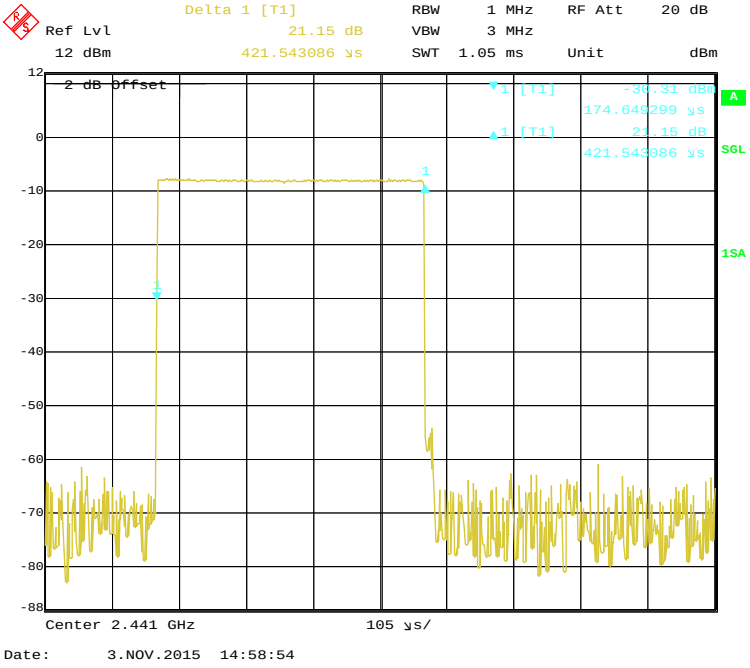
Test Result: Compliance. Please refer to following tables and plots

Mode		Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
BDR (GFSK)	DH 1	Low	0.421	0.135	0.4	Pass
		Middle	0.422	0.135	0.4	Pass
		High	0.424	0.136	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.680	0.269	0.4	Pass
		Middle	1.668	0.267	0.4	Pass
		High	1.668	0.267	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.931	0.313	0.4	Pass
		Middle	2.931	0.313	0.4	Pass
		High	2.931	0.313	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (π/4-DQPSK)	DH 1	Low	0.432	0.138	0.4	Pass
		Middle	0.432	0.138	0.4	Pass
		High	0.432	0.138	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.682	0.269	0.4	Pass
		Middle	1.688	0.270	0.4	Pass
		High	1.688	0.270	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.921	0.312	0.4	Pass
		Middle	2.911	0.311	0.4	Pass
		High	2.921	0.312	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (8DPSK)	DH 1	Low	0.433	0.139	0.4	Pass
		Middle	0.431	0.138	0.4	Pass
		High	0.435	0.139	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.680	0.269	0.4	Pass
		Middle	1.680	0.269	0.4	Pass
		High	1.680	0.269	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.936	0.313	0.4	Pass
		Middle	2.926	0.312	0.4	Pass
		High	2.926	0.312	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				

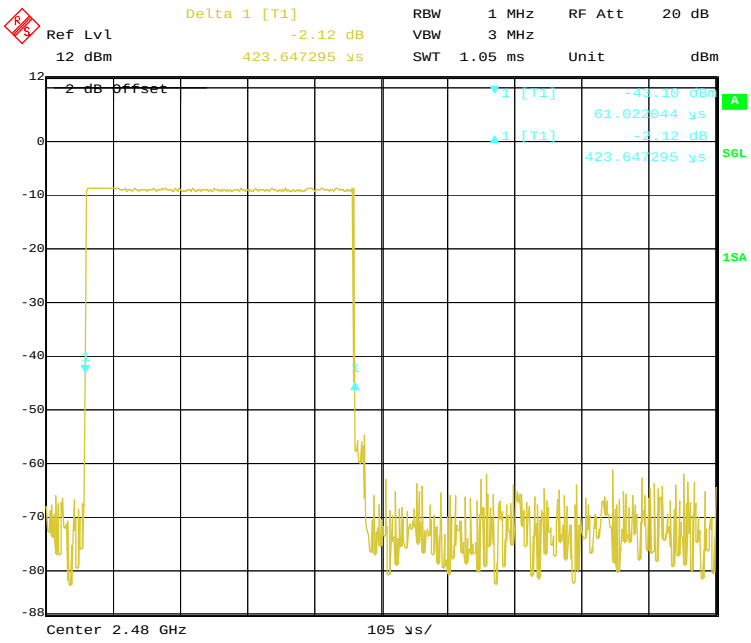
BDR (GFSK):
Pulse time, Low Channel, DH1



Pulse time, Middle Channel, DH1

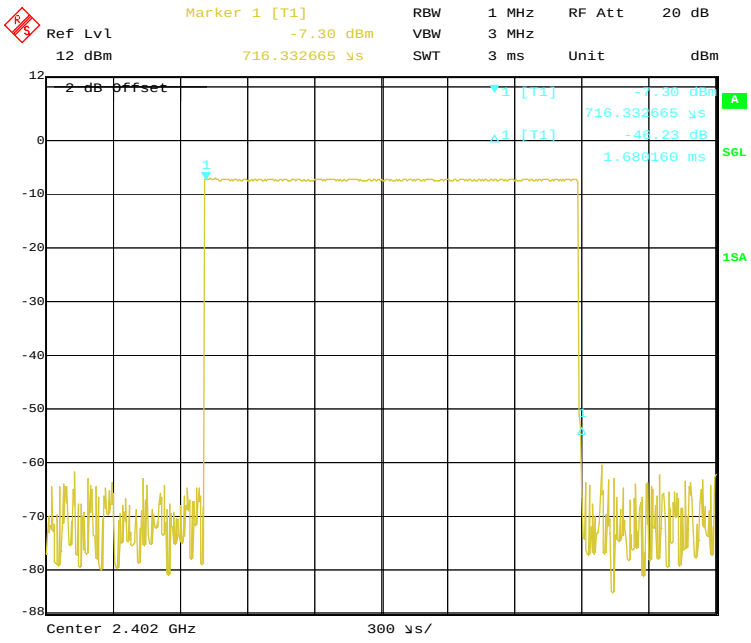


Pulse time, High Channel, DH1



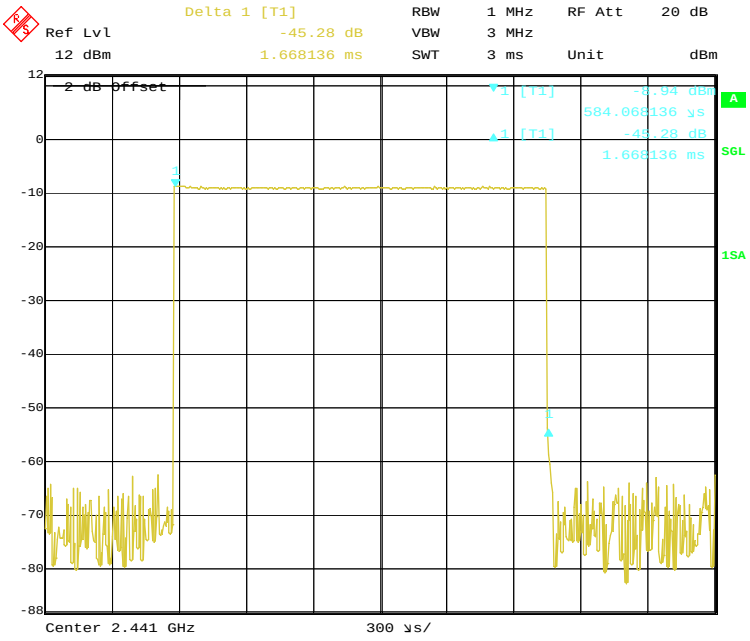
Date: 3.NOV.2015 15:00:10

Pulse time, Low Channel, DH3



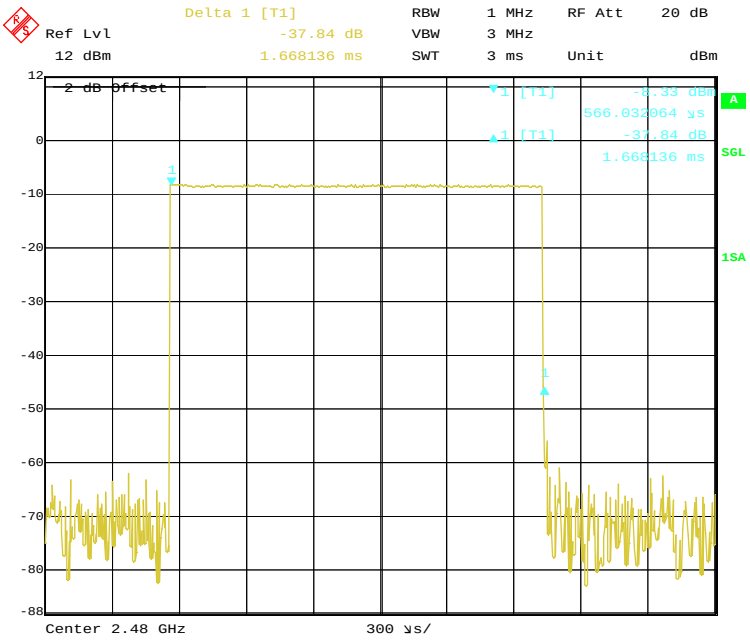
Date: 3.NOV.2015 15:03:43

Pulse time, Middle Channel, DH3



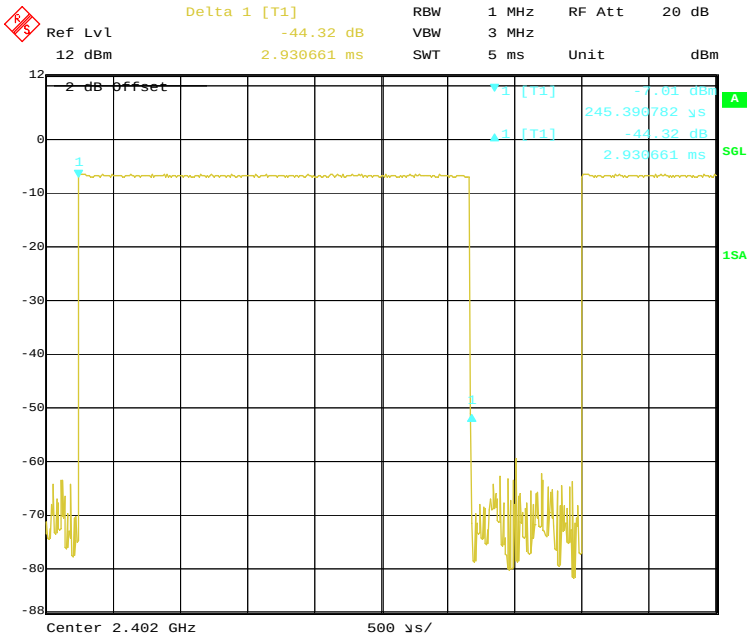
Date: 3.NOV.2015 15:04:39

Pulse time, High Channel, DH3

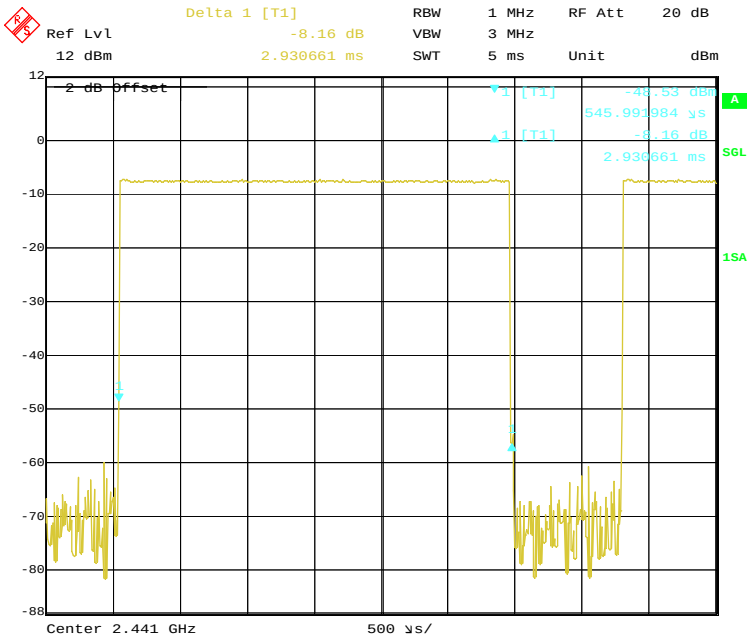


Date: 3.NOV.2015 15:05:35

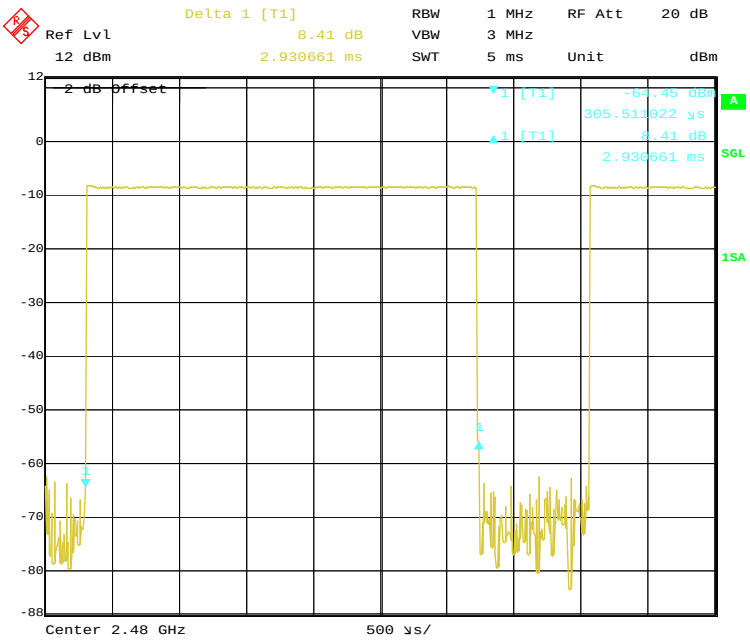
Pulse time, Low Channel, DH5



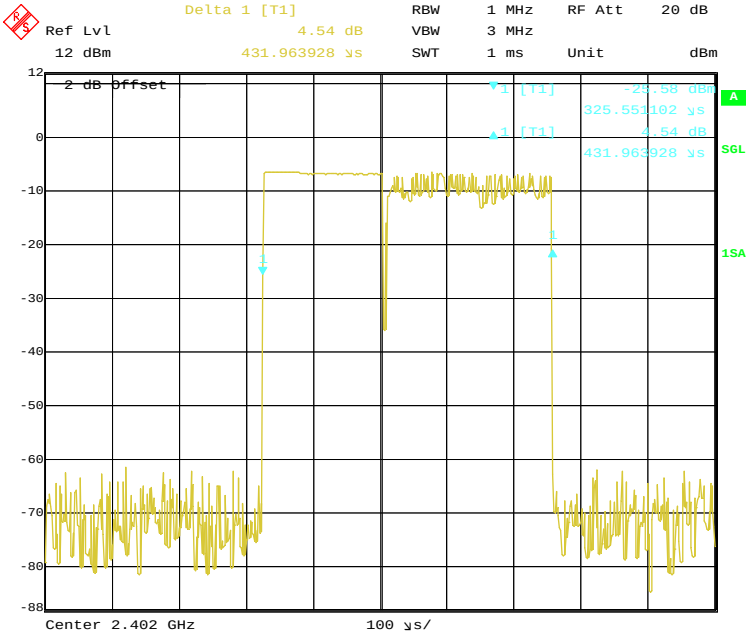
Pulse time, Middle Channel, DH5



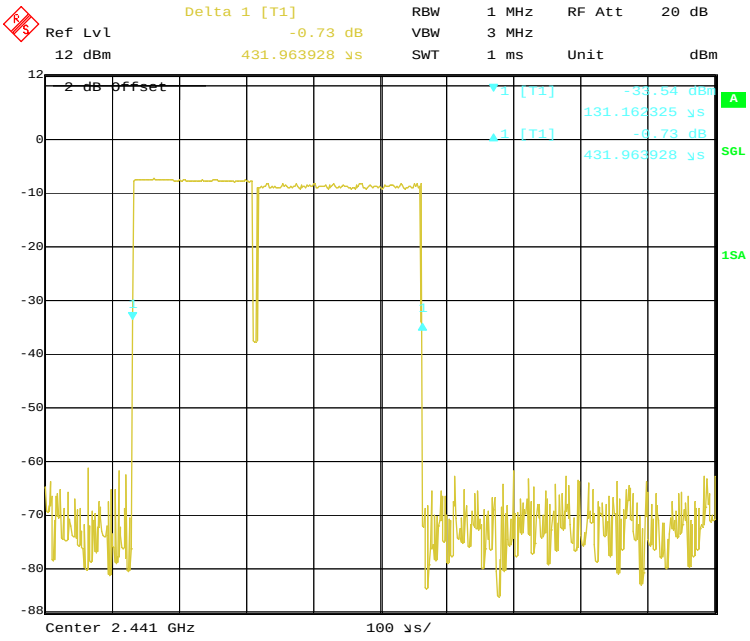
Pulse time, High Channel, DH5



EDR (π/4-DQPSK):
Pulse time, Low Channel, DH1

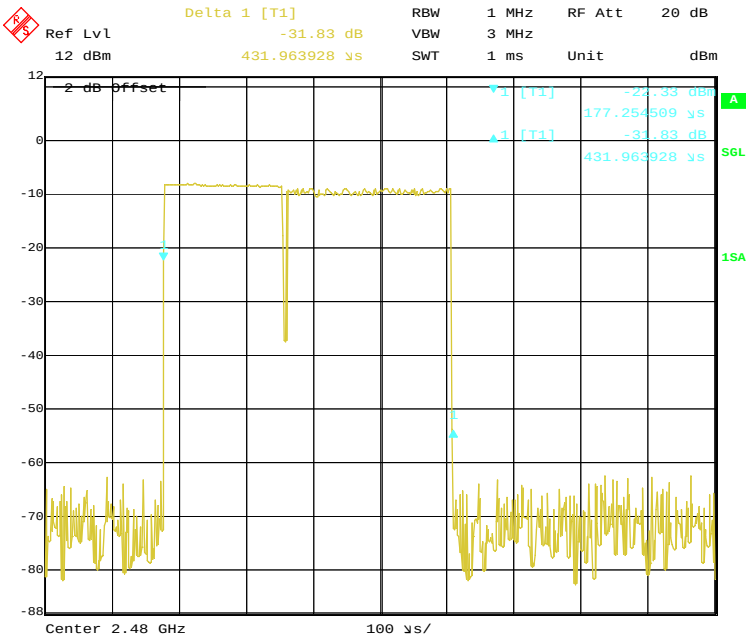


Pulse time, Middle Channel, DH1



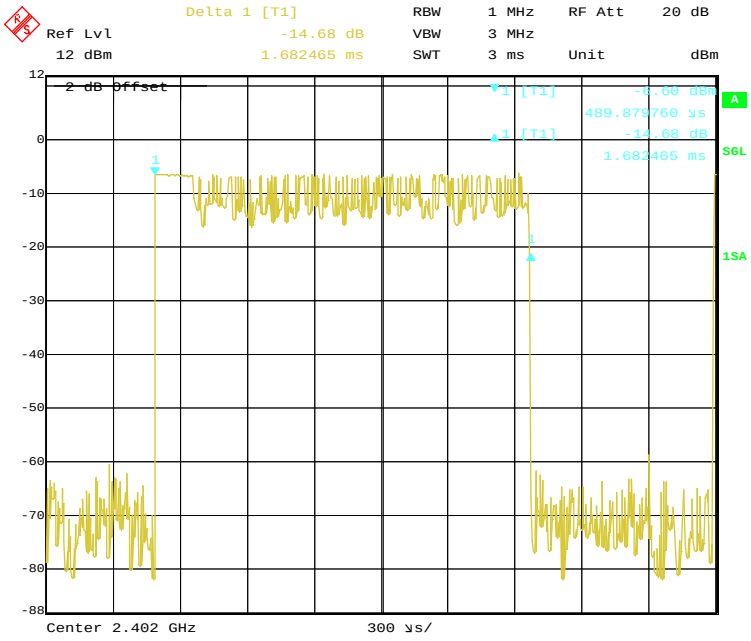
Date: 3.NOV.2015 15:12:51

Pulse time, High Channel, DH1

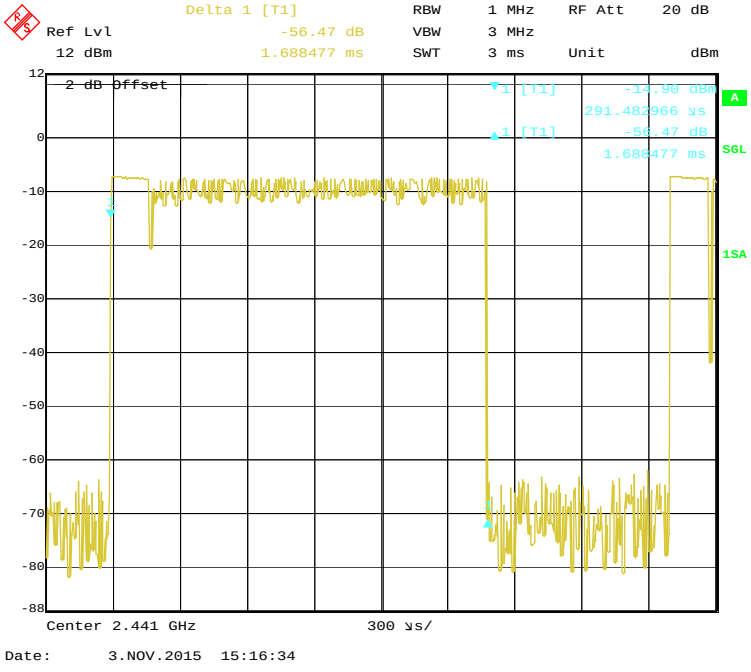


Date: 3.NOV.2015 15:14:02

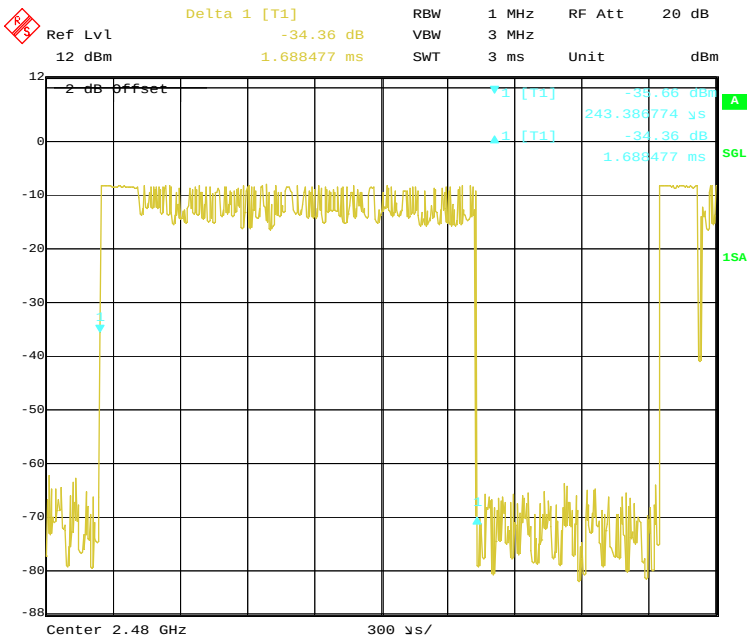
Pulse time, Low Channel, DH3



Pulse time, Middle Channel, DH3

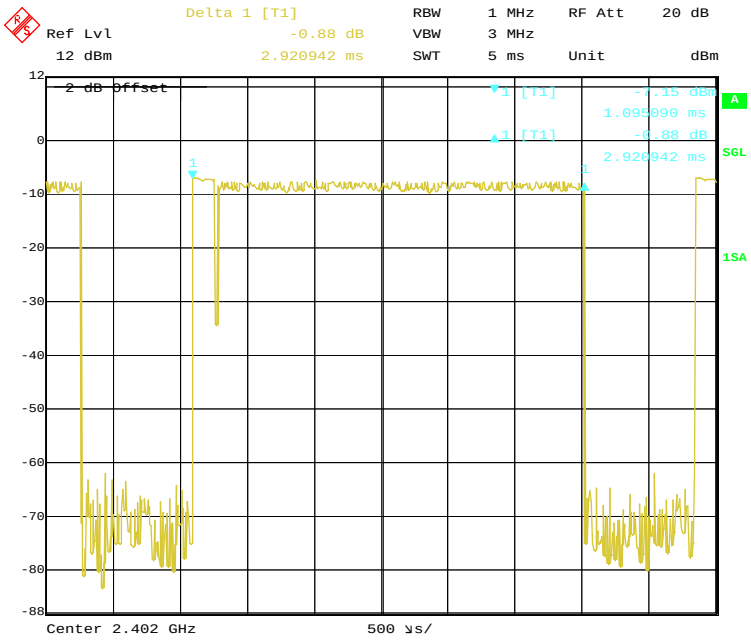


Pulse time, High Channel, DH3



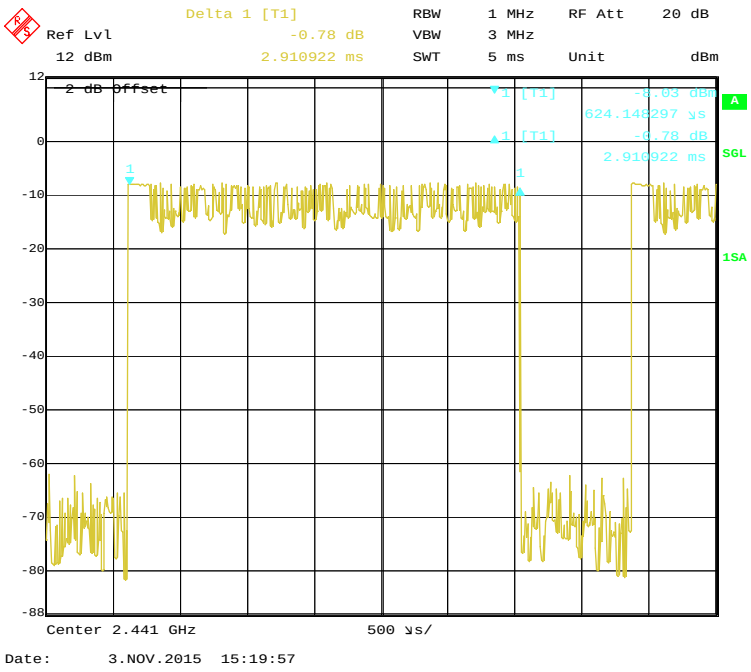
Date: 3.NOV.2015 15:17:19

Pulse time, Low Channel, DH5

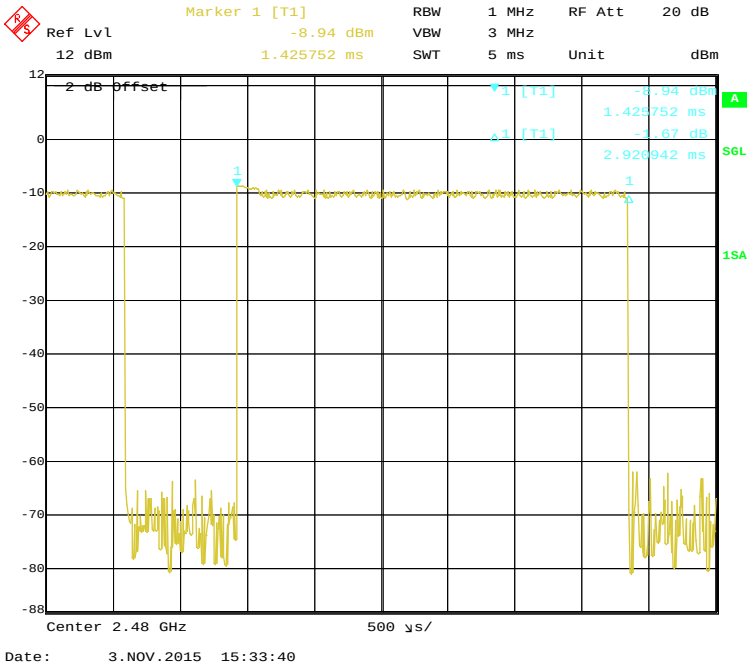


Date: 3.NOV.2015 15:19:18

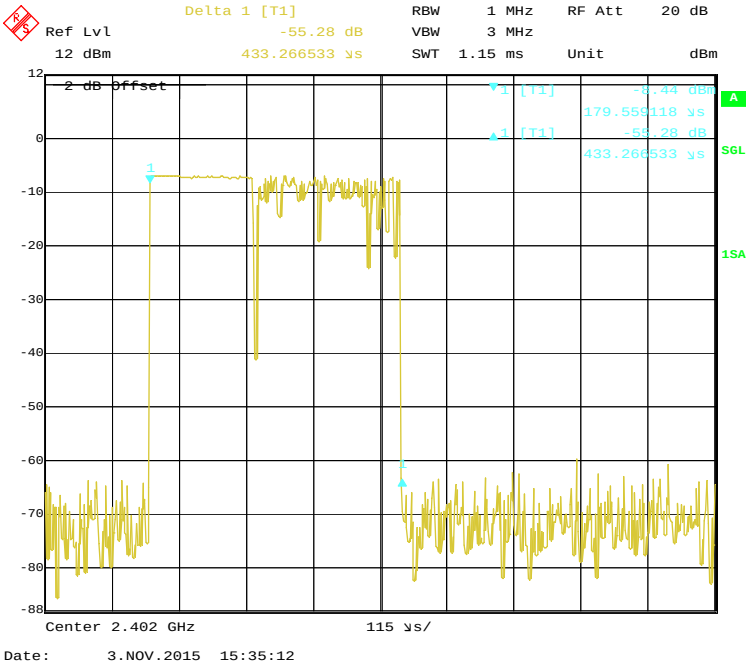
Pulse time, Middle Channel, DH5



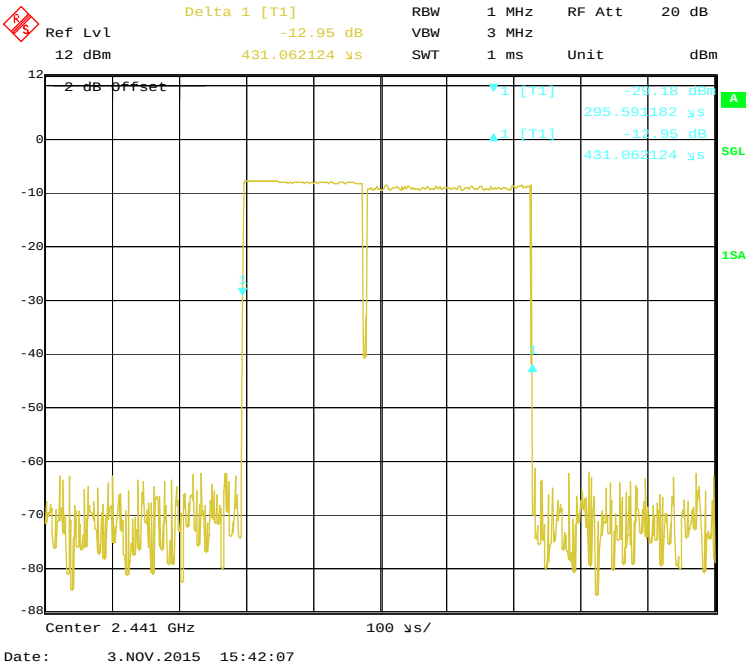
Pulse time, High Channel, DH5



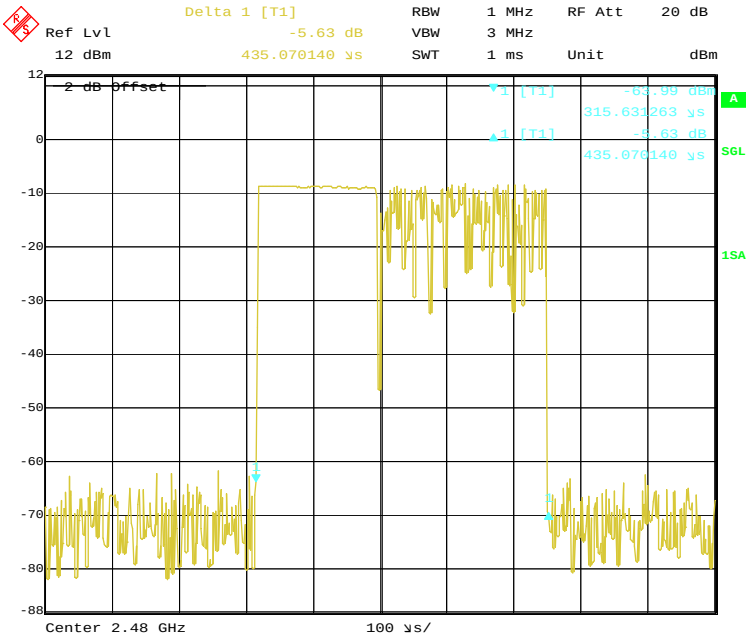
EDR (8DPSK):
Pulse time, Low Channel, DH1



Pulse time, Middle Channel, DH1

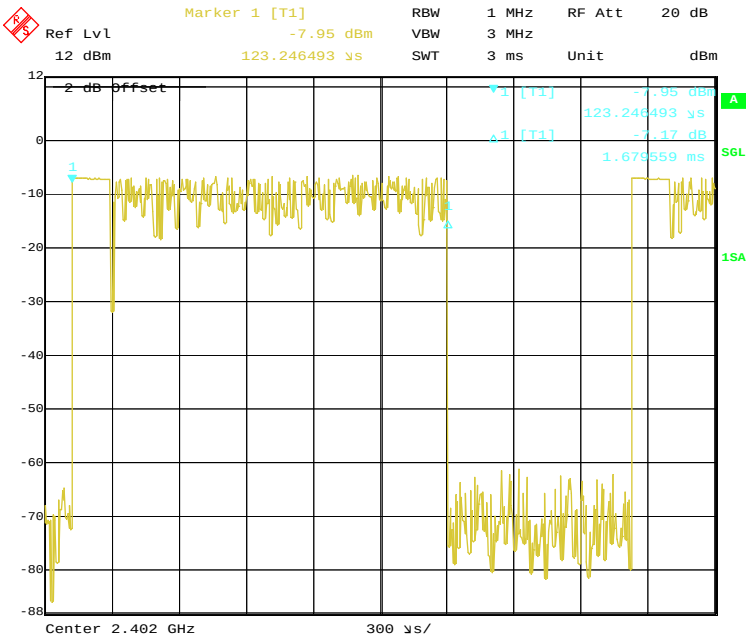


Pulse time, High Channel, DH1



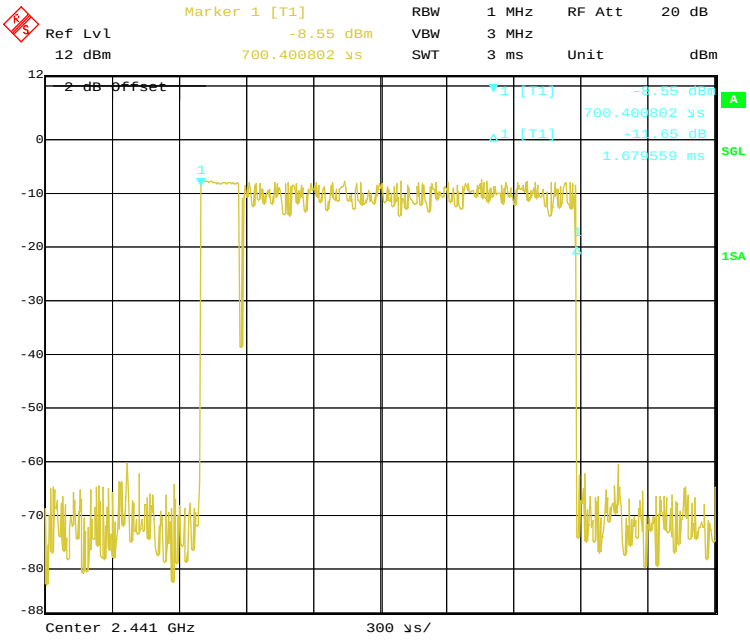
Date: 3.NOV.2015 15:43:57

Pulse time, Low Channel, DH3



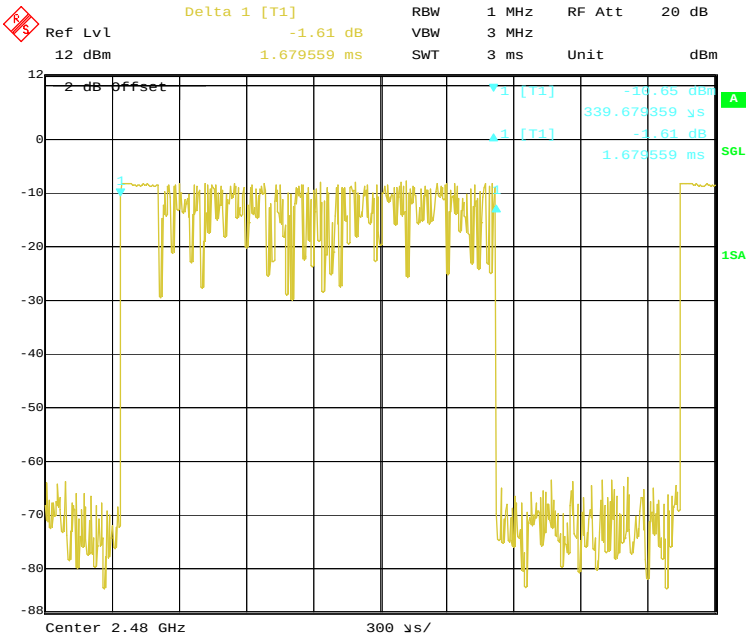
Date: 3.NOV.2015 15:45:27

Pulse time, Middle Channel, DH3



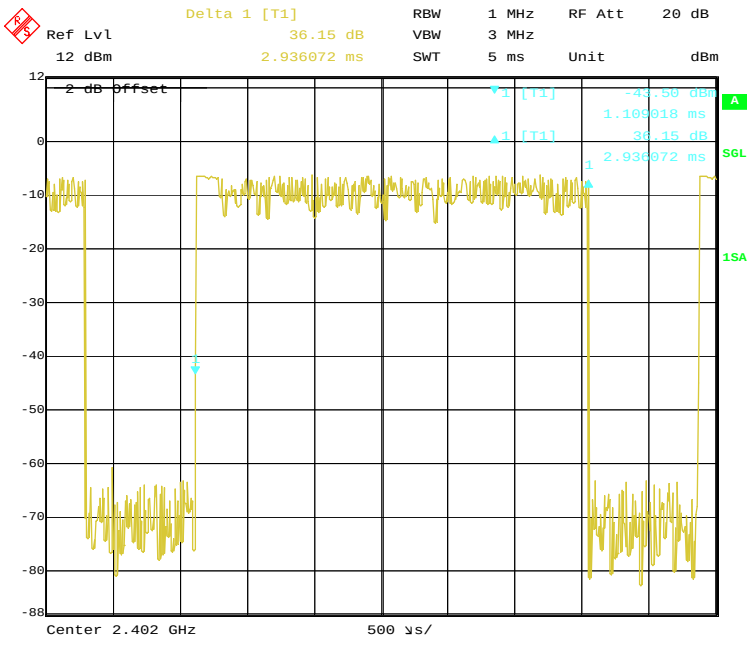
Date: 3.NOV.2015 15:46:46

Pulse time, High Channel, DH3



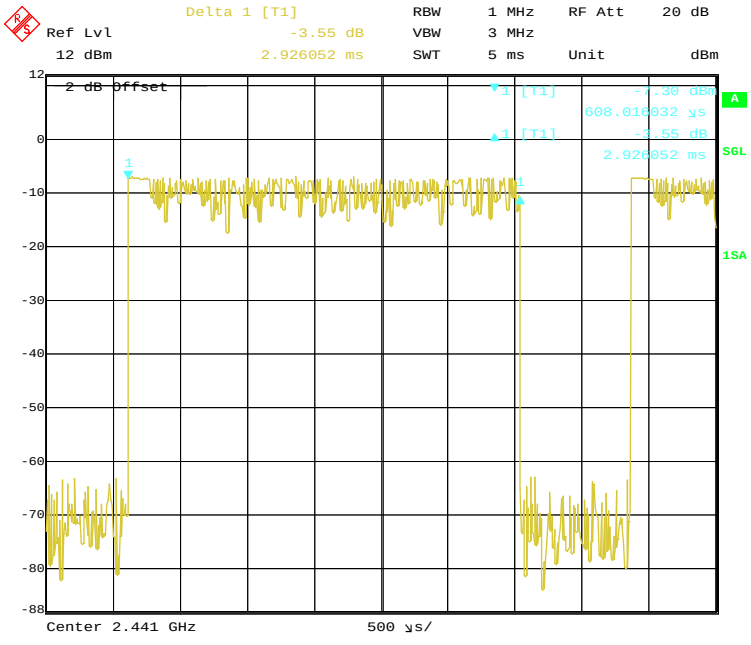
Date: 3.NOV.2015 15:47:32

Pulse time, Low Channel, DH5



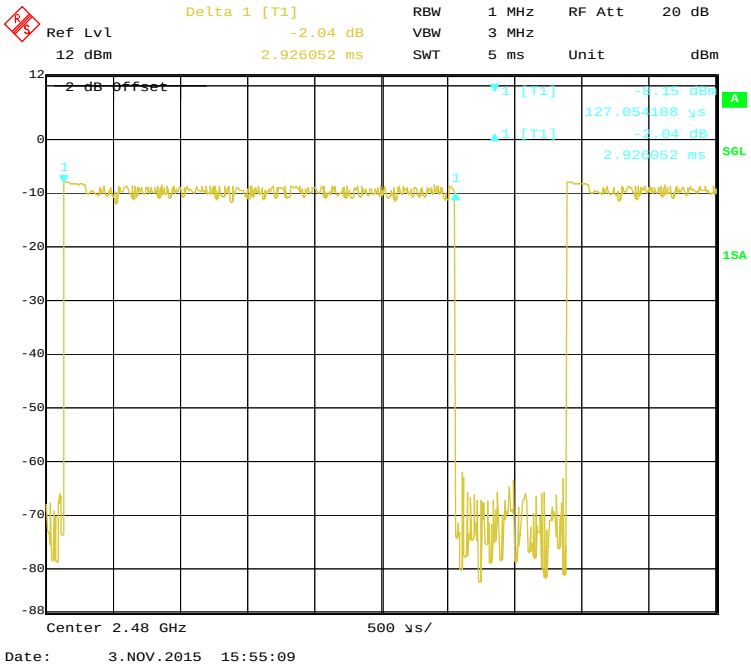
Date: 3.NOV.2015 15:52:09

Pulse time, Middle Channel, DH5



Date: 3.NOV.2015 15:54:23

Pulse time, High Channel, DH5



FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2014-11-12	2015-11-11
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-06-16	2015-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

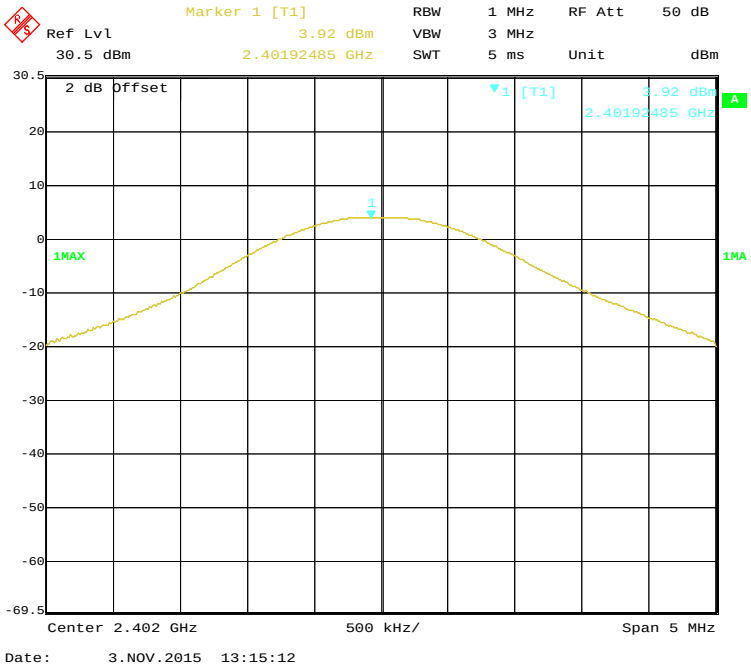
Temperature:	26 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Matt Yao on 2015-11-03
EUT operation mode: Transmitting

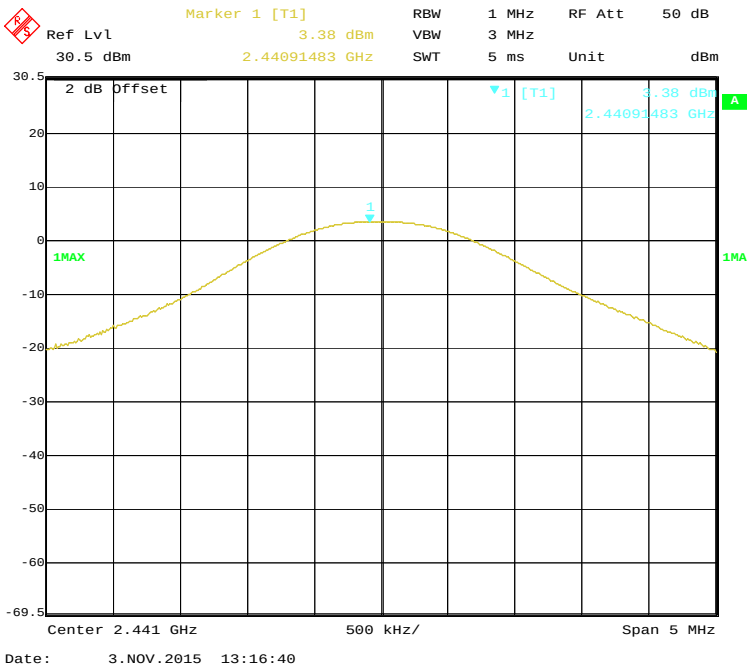
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	Conducted Output Power		Limit (mW)
			(dBm)	(mW)	
BDR (GFSK)	Low	2402	3.92	2.466	1000
	Middle	2441	3.38	2.178	1000
	High	2480	2.63	1.832	1000
EDR (π/4-DQPSK)	Low	2402	3.31	2.143	1000
	Middle	2441	2.80	1.905	1000
	High	2480	2.60	1.820	1000
EDR (8DPSK)	Low	2402	3.51	2.244	1000
	Middle	2441	2.87	1.936	1000
	High	2480	2.18	1.652	1000

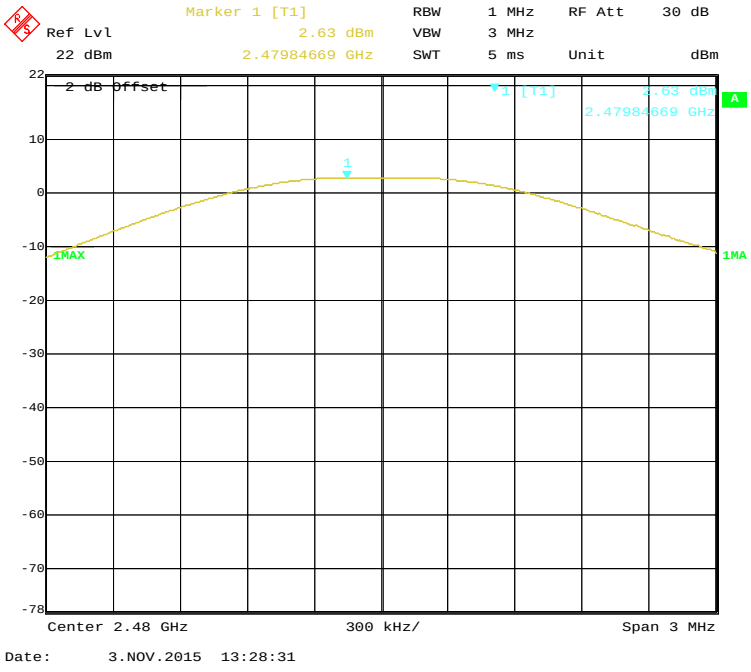
BDR (GFSK): Low Channel



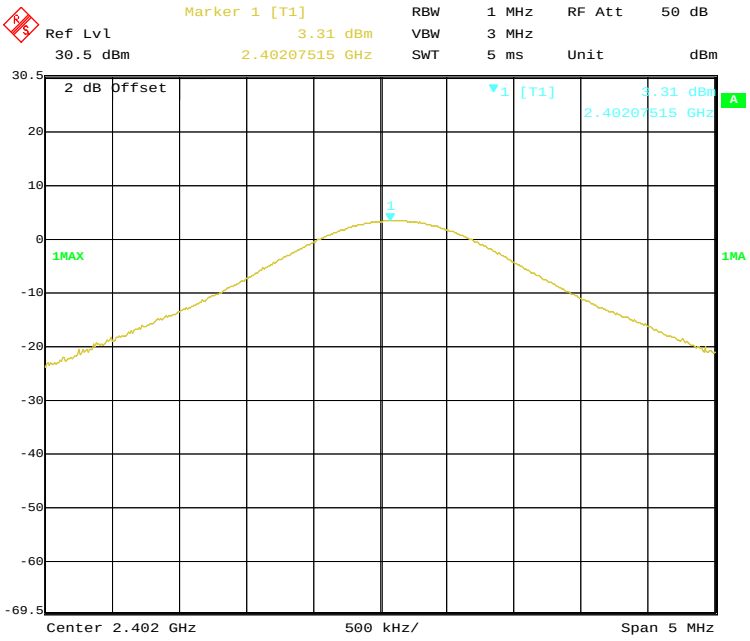
BDR (GFSK): Middle Channel



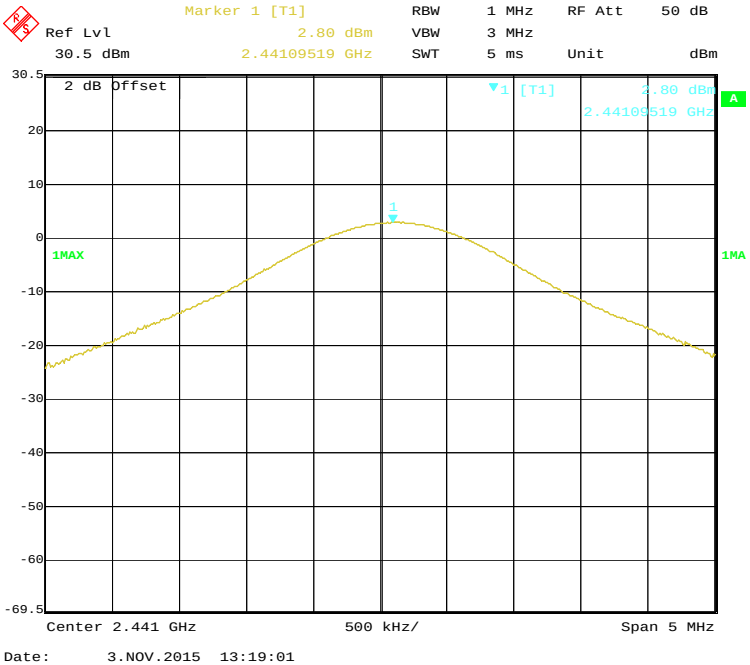
BDR (GFSK): High Channel



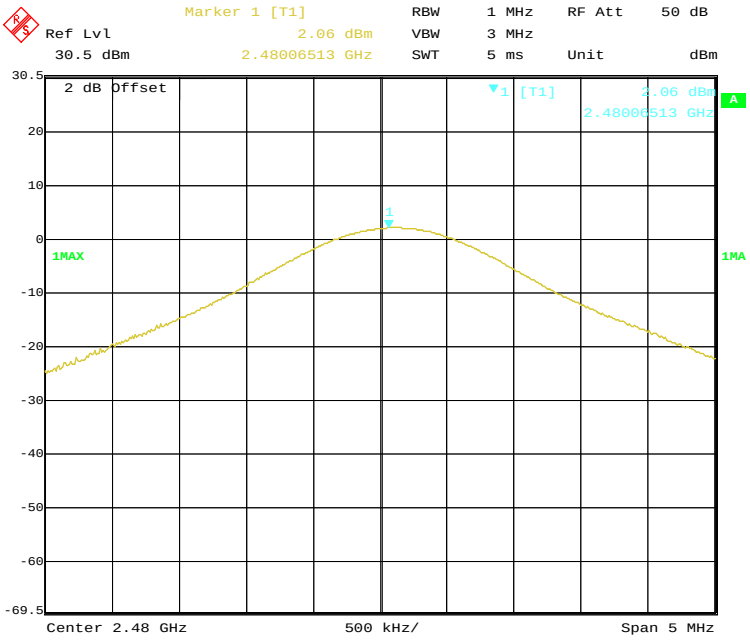
EDR(π/4-DQPSK): Low Channel



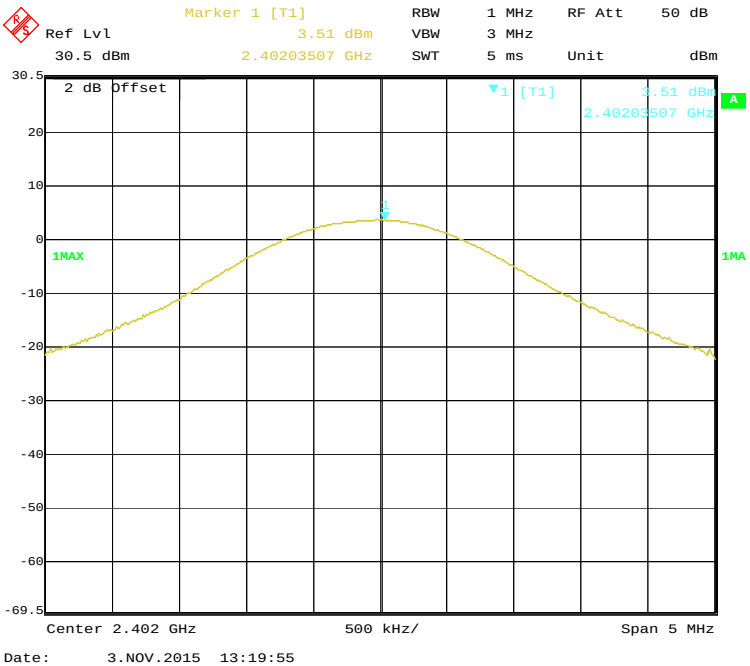
EDR(π/4-DQPSK): Middle Channel



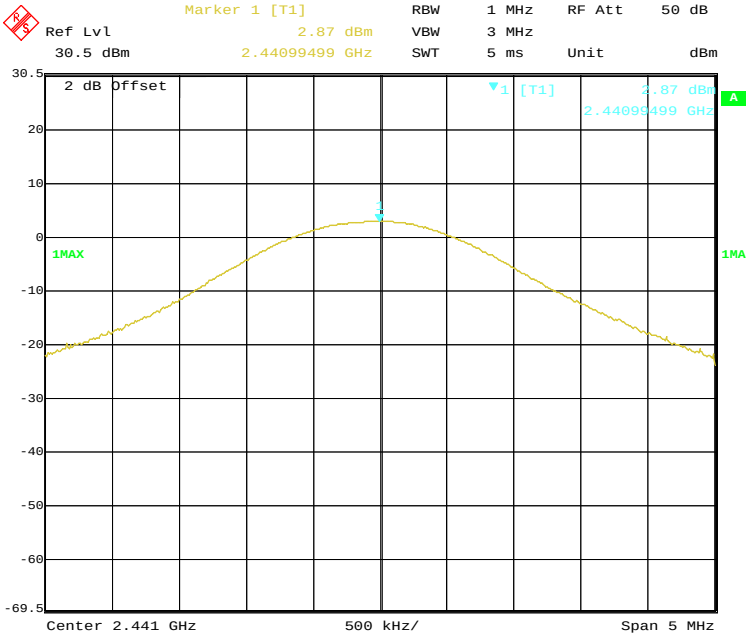
EDR(π/4-DQPSK): High Channel



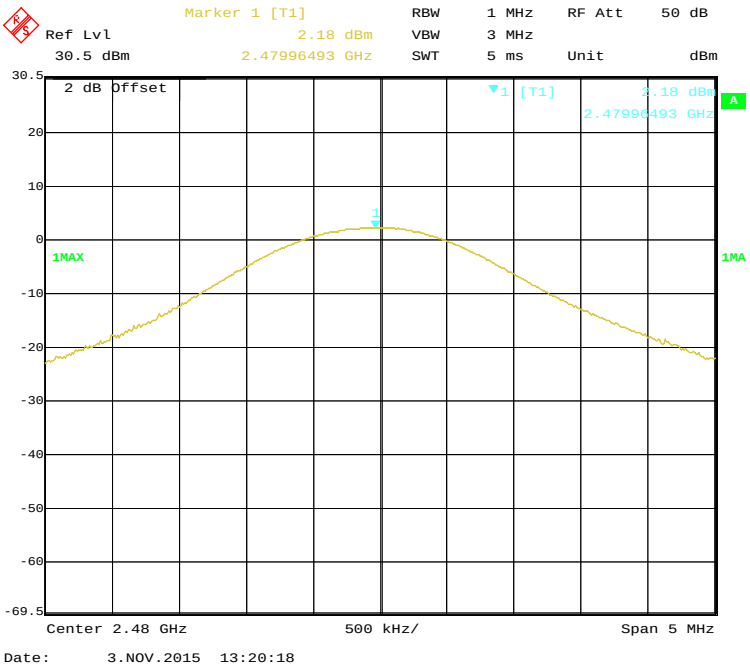
EDR(8DPSK): Low Channel



EDR(8DPSK): Middle Channel



EDR(8DPSK): High Channel



FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2014-11-12	2015-11-11
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-06-16	2015-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

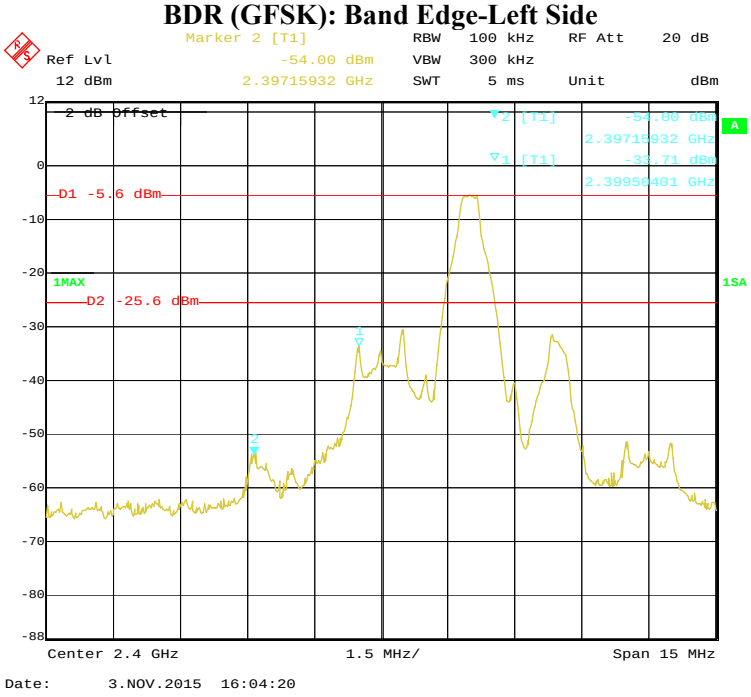
Temperature:	26 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Matt Yao on 2015-11-03

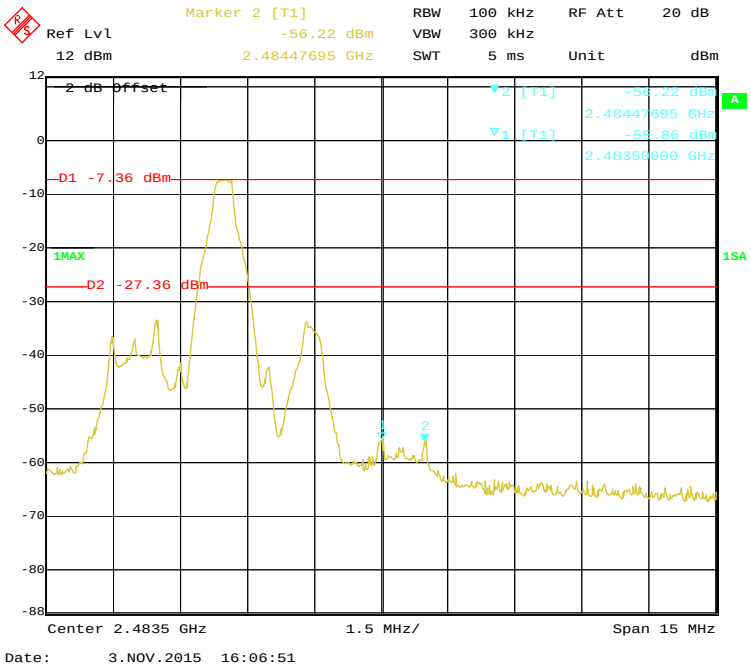
EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following plots.

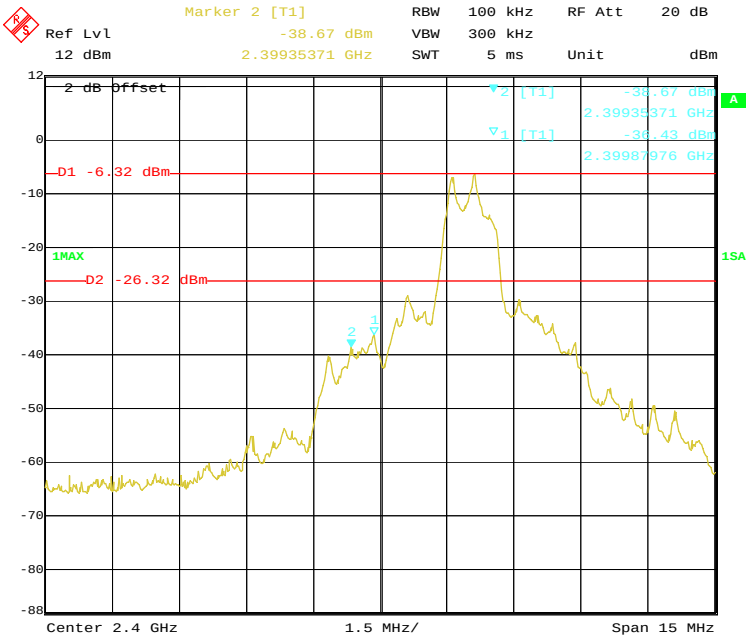
BDR (GFSK): Band Edge-Left Side



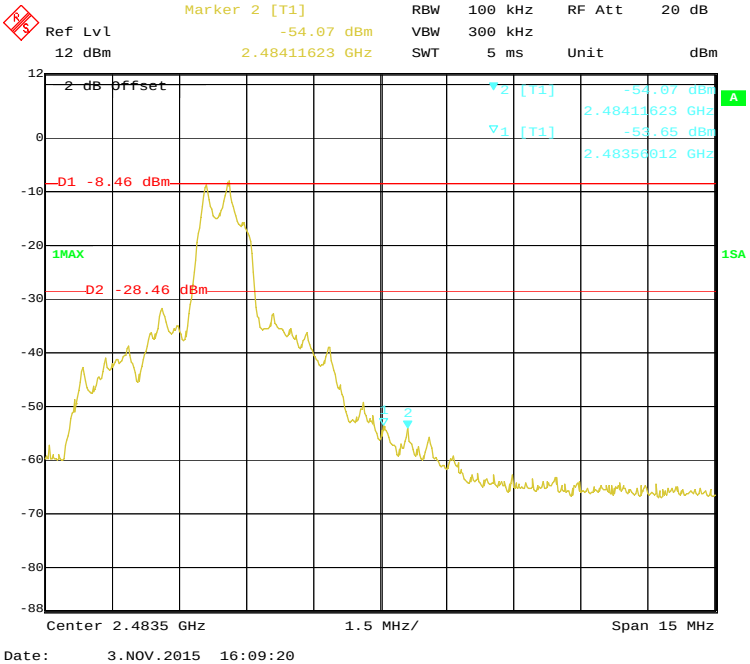
BDR (GFSK): Band Edge-Right Side



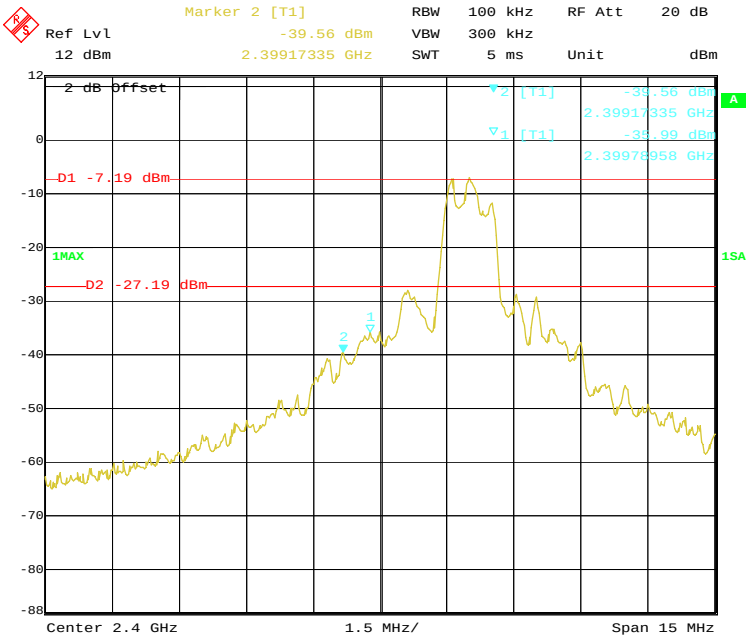
EDR (π/4-DQPSK): Band Edge-Left Side



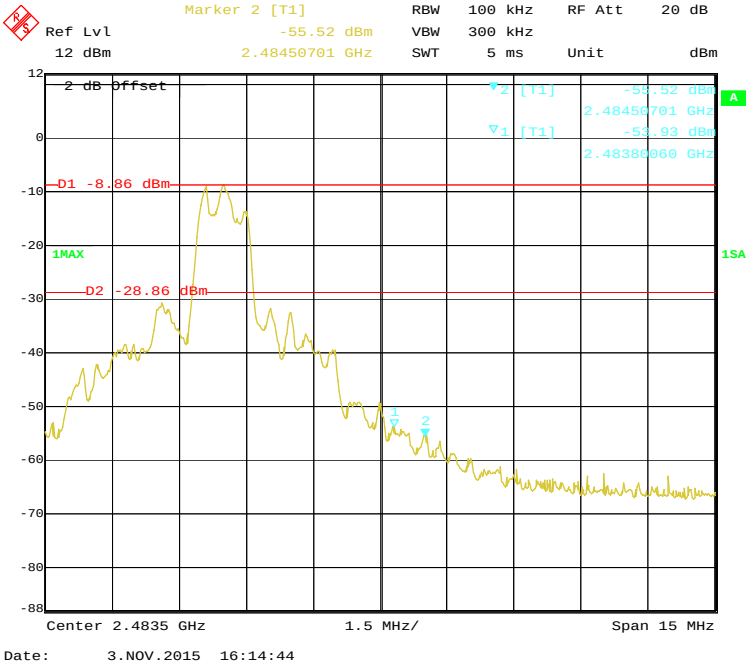
EDR (π/4-DQPSK): Band Edge-Right Side



EDR (8DPSK): Band Edge-Left Side



BDR (8DPSK): Band Edge-Right Side



******* END OF REPORT *******